НОВОСИБИРСКИЙ ГОСУДАРСТВЕННЫЙ
АГРАРНЫЙ УНИВЕРСИТЕТ

Факультет экономики и управления

ENGLISH FOR AUTOMOTIVE MECHANICS

**Учебно-методическое пособие для бакалавров,
магистрантов и аспирантов**

НОВОСИБИРСК 2024

Кафедра иностранных языков

УДК 811.111(075.32):629.3
ББК 81.2Англ-923

Составители: ст. преподаватель ***Е.Ю. Сементовская,***
зав. кафедрой, канд. филол. н., доц. ***Е.Г. Коротких***

Рецензент: канд. филол. наук, доц. каф. теории языка и межкультурной коммуникации НГПУ ***Н.В. Носенко***

English for Automotive Mechanics: учебно-методическое пособие / Новосиб. гос. аграр. ун-т. фак. ЭиУ; авторы-сост.: Е.Ю. Сементовская, Е.Г. Коротких. – Новосибирск, 2024. – 289 с.

Учебно-методическое пособие предназначено для аудиторной и самостоятельной работы с учебным материалом профессиональной направленности на английском языке. Разделы пособия содержат текстовый материал профессионально-ориентированного характера. Издание призвано помочь студентам сформировать необходимые знания, умения и навыки: умение читать и анализировать тексты на английском языке с целью не только извлечения информации, но и приобретения навыков устной и письменной специализированной коммуникации. Учебный материал пособия может быть использован для самостоятельной работы студентов и в качестве заданий для промежуточной и итоговой аттестации по дисциплинам блока «Иностранный язык (английский)».

Пособие может быть использовано в качестве основной или дополнительной литературы для всего набора дисциплин блока «Иностранный язык» инженерных направлений подготовки бакалавриата, специалитета, магистратуры, аспирантуры очной и заочной форм обучения.

Утверждено и рекомендовано к изданию методическим советом Инженерного института (протокол №11 от 27.06.2023).

© Новосибирский государственный аграрный университет, 2024

СОДЕРЖАНИЕ

ПОЯСНИТЕЛЬНАЯ ЗАПИСКА.....6

РАЗДЕЛ 1. РАБОТА С ТЕКСТОВЫМ МАТЕРИАЛОМ ПРОФЕССИОНАЛЬНОЙ НАПРАВЛЕННОСТИ.....8

Тексты профессиональной направленности с практическими заданиями по инженерным направлениям подготовки.....8

Unit 1. AUTOMOTIVE MECHANIC JOB PROFILE..... 8
Unit 2. MAJOR PROS AND CONS OF BEING AN AUTOMOTIVE MECHANIC..... 11
Unit 3. BASIC INTRODUCTION TO AUTO MECHANIC CAREER PATHS AND TOOLS 18
Unit 4. GENERAL AND INTERMEDIATE TOOLS..... 22
Unit 5. FACTORS TO CONSIDER WHEN BUYING MECHANIC TOOLS..... 35
Unit 6. BASIC CAR REPAIRS..... 39
Unit 7. CHANGING A WHEEL AND THE WIPER BLADES..... 45
Unit 8. JUMP-STARTING A CAR AND REPLACING A DEAD BATTERY..... 49
Unit 9. MAIN AND WEIRD MATERIALS USED IN AUTO MANUFACTURING..... 52
Unit 10. TYPES OF CAR BODY STYLES..... 61
Unit 11. CAR BODY PARTS: EXTERIOR..... 68
Unit 12. TYPES OF CAR INTERIOR PARTS..... 74
Unit 13. CLASSIFICATION OF ENGINES BY TYPES OF USED FUEL BY NUMBER OF STROKES PER CYCLE AND TYPE OF COOLING..... 81
Unit 14. CLASSIFICATION OF ENGINES BY NUMBER AND ARRANGEMENT OF CYLINDERS..... 89
Unit 15. IGNITION SYSTEM: TYPES, PARTS AND PRINCIPLE OF OPERATION..... 92
Unit 16. FUEL SYSTEM..... 98
Unit 17. EXHAUST SYSTEM..... 104
Unit 18. ENGINE AND CHASSIS LUBRICATION SYSTEMS..... 110
Unit 19. TYPES OF LUBRICATION SYSTEM IN AUTOMOBILE..... 114
Unit 20. AUTO COOLING SYSTEM..... 118
Unit 21. CAR SUSPENSION SYSTEM: FUNCTIONS, PARTS AND WARNING SIGNS . 122
Unit 22. TYPES OF CAR SUSPENSIONS..... 125
Unit 23. TRANSMISSION SYSTEM..... 131
Unit 24. ELECTRICAL SYSTEM..... 137
Unit 25. CAR'S BASIC ELECTRICAL TERMINOLOGY..... 142
Unit 26. STARTING SYSTEM: COMPONENTS AND FUNCTIONS..... 147
Unit 27. CAR AIR CONDITIONING, HEATING AND VENTILATION SYSTEMS..... 153
Unit 28. TYPES OF MOTORCYCLES..... 159
Unit 29. PARTS OF A MOTORCYCLE..... 166
Unit 30. COMMON MOTORCYCLE PROBLEMS..... 174

РАЗДЕЛ 2. BUSINESS ENGLISH.....181

2.1. Тексты делового характера для изучающего чтения и пересказа.....181

Unit 1. APPLYING FOR A JOB..... 181
Unit 2. RESUME..... 187
Unit 3. INTERVIEWING APPLICANTS FOR JOBS..... 192
Unit 4. BUSINESS LETTERS..... 199

2.2. Тексты делового характера для перевода и работы со специальной лексикой.....206

РАЗДЕЛ 3. БАНК ТЕКСТОВ ПРОФЕССИОНАЛЬНОЙ НАПРАВЛЕННОСТИ.....209

3.1. Classic Cars – the History of Design and Technical Features.....209

Text 1. FORD..... 209

Text 2. GENERAL MOTORS CORPORATION 210
Text 3. MERCEDES-BENZ 300SL 211
Text 4. AC COBRA 212
Text 5. ALFA ROMEO SPIDER 213
Text 6. VOLKSWAGEN BEETLE 215
Text 7. VOLKSWAGEN PASSAT 216
Text 8. JAGUAR 217
Text 9. LOTUS ELAN 218
Text 10. VOLKSWAGEN GOLF GTI 220
Text 11. JAGUAR MARK II 221
Text 12. FORD MUSTANG 222
Text 13. ROLLS ROYCE – SILVER SHADOW 224
Text 14. CITROEN 225
Text 15. MITSUBISHI 226
Text 16. ROVER 226
Text 17. FIAT 227
Text 18. PEUGEOT 405 228
Text 19. MAZDA 229
Text 20. FERRARI 250 GTO 230
Text 21. TRIUMPH TR4/TR5/TR6 231
Text 22. MINI (Part 1) 233
Text 23. MINI (Part 2) 234
Text 24. AUSTIN HEALEY 100 & 3000 235
3.2. Tools and Measuring equipment for service stations and car workshops 237
Text 1. CAR MAINTENANCE HAND TOOLS 237
Text 2. WRENCHES 237
Text 3. SOCKET WRENCHES 239
Text 4. TORQUE WRENCHES 240
Text 5. TORQUE ANGLE GAUGE 241
Text 6. OIL FILTER WRENCH 242
Text 7. SCREWDRIVERS 243
Text 8. PLIERS 245
Text 9. CRIMPING PLIERS 246
Text 10. HAMMERS 247
Text 11. CHISELS AND PUNCHES 248
Text 12. PULLERS 249
Text 13. THREAD TAPPERS 250
Text 14. POP RIVET GUNS 251
Text 15. FLARING TOOLS 251
Text 16. SUSPENSION TOOLS 252
Text 17. AIR TOOLS. AIR COMPRESSOR 253
Text 18. AIR SYSTEM DRYING AND LUBRICATION 254
Text 19. AIR NOZZLE AND TIRE INFLATOR GUN 255
Text 20. AIR IMPACT WRENCH 256
Text 21. AIR RATCHET AND AIR DRILL 256
Text 22. AIR HAMMER AND AIR GREASE GUN 257
Text 23. ELECTRIC TOOLS. DRILL 258
Text 24. ANGLE GRINDER AND ELECTRIC SCREWDRIVER 259
Text 25. SOLDERING IRON 260
Text 26. MEASURING EQUIPMENT 261
Text 27. MEASURING TAPES AND RULER 262
Text 28. FEELER GAUGES 262
Text 29. VERNIER CALIPER 263
Text 30. MICROMETER 265
Text 31. DIAL INDICATOR 267
Text 32. TEST LIGHT 268

Text 33. CIRCUIT TESTER PROBE 269
Text 34. MULTIMETER 269
Text 35. CURRENT CLAMP 271
Text 36. DIAGNOSTIC TOOL 272
Text 37. AUTOMOTIVE OSCILLOSCOPE 273

РАЗДЕЛ 4. ИНСТРУКЦИЯ ДЛЯ ПОДГОТОВКИ УСТНОЙ ПРЕЗЕНТАЦИИ ТЕКСТОВОГО МАТЕРИАЛА НА АНГЛИЙСКОМ ЯЗЫКЕ 274
4.1. Поэтапная инструкция по подготовке презентации текстового материала Presentation Preparing Guide 274
4.2. Технология создания электронной презентации текстового материала 276
4.2.1. Облако слов 276
4.2.2. Диаграмма связей / ассоциативная карта 277
4.2.3. Шаги по созданию и работе с узлами ассоциативной карты 277
4.2.4. Ментальная карта 279

РАЗДЕЛ 5. МЕТОДИЧЕСКИЕ РЕКОМЕНДАЦИИ ПО ОРГАНИЗАЦИИ САМОСТОЯТЕЛЬНОЙ РАБОТЫ INDEPENDENT WORK GUIDE 280
5.1. Рекомендации по организации работы с текстами для чтения 280
5.2. Методические рекомендации для студентов 281
5.2.1. Чтение с полным пониманием прочитанного 281
5.2.2. Чтение с пониманием основного содержания 282
5.3. Рекомендации для написания рефератов, аннотаций 282
5.3.1. Рекомендуемые клише для оформления реферата на английском языке 282
5.3.2. Алгоритм составления реферата 283
5.3.3. Клише для обсуждения реферата 283
5.3.4. Аннотирование текста 284
5.4. Рекомендации для разработки проектов 285
5.5. Общие практические рекомендации для изучающих иностранный язык 287

ЛИТЕРАТУРА 288

ПОЯСНИТЕЛЬНАЯ ЗАПИСКА

Данное учебное пособие предназначено для студентов, магистрантов и аспирантов всех направлений подготовки Инженерного института очной и заочной форм обучения.

Пособие рассчитано на 60-70 уч. часов аудиторных занятий и 100-120 часов самостоятельной работы, что соответствует базовым стандартам ФГОС. Издание может быть использовано в научно-исследовательской работе магистрантов и при подготовке к сдаче кандидатского экзамена по английскому языку.

В основных разделах пособия представлены: 1) учебно-тематические блоки; 2) работа с текстовым материалом делового характера; 3) текстовый и методический материал для изучающего, ознакомительного чтения, подготовки рефератов и научных докладов; 4) рекомендации и справочный материал для эффективной подготовки профессиональной и научной презентации; 5) методические указания по организации самостоятельной работы.

Материал основного раздела «Работа с текстовым материалом профессиональной направленности» организован в 30 учебно-тематических блоках (Units). Units 1-14 соответствуют уровню языковой подготовки А2, ориентированы, прежде всего, на уровень бакалавриата. Каждый блок открывается тематически ведущим текстом для изучающего чтения, который сопровождается предтекстовым глоссарием и послетекстовыми заданиями на понимание и обсуждение (Comprehension Check). Units 15-30 соответствуют уровню языковой подготовки В1-В2 и ориентированы на уровни магистратуры и аспирантуры. Данные блоки содержат объёмный текстовый материал, который для удобства освоения, может быть разделён на две части (Part 1, Part 2). Помимо заданий на понимание и обсуждение, все блоки включают тренинг по академическому чтению, устной и письменной практике. В комплекс упражнений в юнитах 15-30, соответствующих уровню языковой подготовки В1-В2, входит упражнение, предусматривающее поиск дополнительного материала в интернете и создание презентаций на его основе.

Раздел «Работа с текстовым материалом делового характера» содержит учебный материал по деловому английскому языку, который представлен в 4 учебно-тематических блоках и подборке текстов делового характера для перевода и работы со специальной лексикой. Цель раздела – обучить основам делового общения в устной и письменной формах. Тематика блоков определяется ситуацией устройства на работу, которая требует правильного заполнения типовых письменных форм и подготовки к устному собеседованию.

Раздел пособия «Банк текстов профессиональной направленности» представляет собой обширную подборку аутентичных текстов профессиональной тематики. Текстовый банк делится на две тематические части: 1) Classic cars – the history of design and technical features, 2) *Tools and measuring equipment for service stations and car workshops. Первая тематическая подборка в большей степени ориентирована на освоение лексики, связанной с конструктивными особенностями автомобильной техники. Вторая подборка позволяет подробно изучить довольно обширный пласт специальной лексики, номинирующий большое количество инструментов, приборов и оборудования.*

Раздел «Инструкция для подготовки устной презентации текстового материала на английском языке» содержит методические рекомендации по общему алгоритму

создания устных презентаций. Презентации могут выполняться студентами по текстам, представленным в текстовом банке. В разделе также содержится подробный справочный материал по компьютерным технологиям подготовки докладов и презентаций.

Раздел «Методические рекомендации по организации самостоятельной работы» ставят целью методическое обеспечение процесса самостоятельной работы и самоподготовки студентов. Как правило, самостоятельная работа студентов – это подготовка пересказа, реферата, аннотации, проекта. Подробные рекомендации по подготовке данных видов самостоятельной учебной деятельности представлены в разделе.

Основные навыки, освоение которых является первоочередной задачей данного пособия:

– навык корректного перевода текстов профессиональной направленности;

– навык академически правильного устного представления/презентации контента профессиональной направленности.

– формирование навыков устной и письменной профессиональной коммуникации.

Таким образом, каждый блок, через тексты и систему упражнений стимулирует интерес обучающихся к научной коммуникации на иностранном языке, повышает мотивацию к процессу обучения, способствует формированию основных и профессиональных компетенций:

– способность применять иностранный язык в сфере профессиональной деятельности;

– способность к письменной и устной профессиональной коммуникации на иностранном языке;

– способность использовать знание иностранного языка для получения профессиональной информации из иностранных источников.

Пособие может быть использовано в разнообразных условиях учебного процесса для развития базовой коммуникативной компетенции – умения получать, перерабатывать и передавать информацию на иностранном языке.

РАЗДЕЛ 1. РАБОТА С ТЕКСТОВЫМ МАТЕРИАЛОМ ПРОФЕССИОНАЛЬНОЙ НАПРАВЛЕННОСТИ

Тексты профессиональной направленности с практическими заданиями по инженерным направлениям подготовки

Unit 1. AUTOMOTIVE MECHANIC JOB PROFILE

Exercise 1. Read and memorize the words and word combinations.

1. job profile должностная инструкция, профиль работы
2. salary размер оплаты труда
3. fix ремонтировать
4. car машина, автомобиль
5. vehicle автомобиль, автотранспортное средство
6. automotive/car mechanic автомеханик (специалист, руководящий процессом ремонта)
7. automotive/car service technician слесарь по ремонту автомобилей, автослесарь (специалист более узкого профиля и часто работает по одному направлению, например, ремонт кузовов, устранение несложных неисправностей и т. д.)
8. job security обеспеченность работой, гарантия занятости
9. job satisfaction удовлетворение от условий труда, удовлетворённость работой
10. work-life balance баланс между работой и личной жизнью/досугом
11. physically demanding подразумевающий тяжелый физический труд
12. mentally demanding подразумевающий тяжелый умственный труд
13. future outlook перспективы на будущее, оценка будущих перспектив
14. shortage нехватка; недостаток; дефицит
15. requirements должностные требования; требования, предъявляемые к рабочему месту
16. car repair shop автомастерская; СТО
17. decent knowledge хорошее знание
18. service and maintenance периодическое и текущее техническое обслуживание; техническое и сервисное обслуживание

Exercise 2. Read the international words and guess their meanings.

Auto, mechanic, inspect, physically, comfortable, manner, technician, qualified, finish, Russia, profile, university, motorcycle, bike, start, sphere, type, local, practical, plan, business, interest, electric, service.

Exercise 3. Read the information in the Automotive Mechanic Job Profile. Fill in the gaps (1-6) with the words and word combinations given in the box. Translate the job profile into Russian.

Salary, Work-Life Balance, Requirements, Job description, Future Outlook, Physically / Mentally Demanding?

Automotive Mechanic Job Profile

Information source: https://job-evaluator.com/being-an-automotive-mechanic-pros-cons/

1. _____	Auto mechanics inspect and fix cars and other vehicles and make sure that people can drive them in a safe and comfortable manner.
2. _____	$47,000 per year on average, most automotive technicians make between $34,000 and $51,000 per year.
Job Security	Decent since good car mechanics are in high demand right now.
Job Satisfaction	Good if you love to work with cars.
3. _____	Decent since you will have free weekends and you will also not have to work many hours as an auto technician.
4. _____	Working as a car mechanic can be physically demanding.
5. _____	Good since there will be a shortage of qualified auto mechanics in the future.
6. _____	No special educational requirements. In the USA finishing high school will often be enough for becoming an auto mechanic.

Exercise 4. Think about an auto mechanic job in Russia. What information would you change in the above-mentioned Auto Mechanic Job Profile? Search the Web, if necessary. Give your ideas.

Exercise 5. Read and translate the dialogue between two friends. Act it out.

Friend 1: Hello, Mikhail! How are you?

Friend 2: Hi, Max! Fine. I've just entered the university, the Auto Mechanics department.

F. 1: Cool! And why did you decide to be a car mechanic?

F. 2: Well, I like dealing with vehicles. Ever since I was a kid, I've always helped my friends with fixing their bikes and motorcycles. Then, I started to help my Dad in our car repair shop. So, I have some hand-on experience in this sphere and I find fixing cars really exciting!

F. 1: I see. And what about future prospects?

F. 2: Oh, they are really excellent. Qualified auto mechanics are always in high demand. That's why I decided to get higher education in this field and went to our local uni. I want to get decent knowledge about all types of vehicles. Besides, I need to improve my practical skills. And, after university, I'm planning to expand our family business. I'm especially interested in electric cars service and maintenance.

F. 1: Sounds great! Good luck!

Exercise 6. Translate the words and word combinations into Russian using a dictionary.

To be responsible for, to inspect vehicles, to diagnose problems, to perform maintenance, to complete necessary repairs, mechanic experience, to be willing to train, to provide, customer service, to be friendly, to be passionate, to repair or replace worn parts and systems, manual and computerized diagnostic equipment, to present estimates, High School diploma, post-secondary program, automotive service technology, ASE certification, experience, basic computer skills, communication skills, physical strength and stamina.

Exercise 7. Match the words and word combinations (1-9) to their synonyms (a-i).

1. to inspect vehicles	a. regular maintenance
2. worn parts and systems	b. to pick up
3. routine maintenance	c. damaged parts and systems
4. to diagnose problems	d. careful examination
5. customer	e. to examine cars
6. to lift up	f. gifted
7. thorough examination	g. needed
8. required	h. to identify problems
9. talented	i. client

Exercise 8. Read and translate the job posting from the Hire Auto Mechanics website. **Match Parts 1-3 to the titles (a-d).**

Part 1	a. Duties and Responsibilities
Part 2	b. Requirements and Qualifications
Part 3	c. Job Summary

Looking for the Perfect Auto Mechanic

Information source: *https://www.ziprecruiter.com/Career/Auto-Mechanic/What-Is-How-to-Become*

Part 1

We are looking for a talented Auto Mechanic to join our growing company. You will be responsible for inspecting customer vehicles, diagnosing problems with the engine or other systems, perform routine maintenance, and complete necessary repairs. Candidates with more than one year of mechanic experience are preferred, but we are willing to train the right person. We pride ourselves in providing excellent customer service, so you must be friendly and passionate about giving our customers the best repair experience possible.

Part 2

– Examine cars based on customer requests or concerns.

– Perform basic maintenance, including changing motor oil, rotating tires, and checking fluid levels.

– Repair or replace worn parts and systems, such as spark plugs, wheel bearings, brake pads, fuel systems, and sensors.

– Follow checklists to ensure thorough examination of all parts and systems.

– Identify mechanical and electrical problems with both manual and computerized diagnostic equipment.

– Present estimates to customers with an explanation of why repairs are necessary.

– Perform repairs thoroughly and accurately.

– Ensure customer satisfaction at all times.

Part 3

– High School diploma or equivalent preferred.

– Completion of a post-secondary program in automotive service technology a plus.

– ASE certification required.

– Experience with electronic systems maintenance and repair.

– Basic computer skills required.

– Strong communication skills.

– Physical strength and stamina, and the ability to lift up to 50 pounds.

Exercise 9. Do you think you are a perfect auto mechanic? Would you send your resume to this company? Why? /Why not?

Exercise 10. Read and translate the dialogue between an interviewer and an applicant for the job of an auto mechanic. Act it out.

Applying for a Job of an Automotive Mechanic

Interviewer: Good morning!

Applicant: Morning!

I.: Well, tell me about yourself and what can you bring to our company.

A.: First of all, I have a good education. I graduated from the university and I have a Bachelor Degree in Automotive Industry, majoring in Car Mechanics.

I.: That's great. I see it in your resume. And it's also written here that you've already had 5 years of mechanic experience. But you graduated only last year. Can you explain that?

A.: Yes, sure. I've always been curious about cars. When I was a teenager, I took my granny's old car apart just to see how it works. Then I repaired it. Since that time our friends and neighbours asked me to help them with their car maintenance and repair. So, I've been working as a DIY mechanic for a few years already.

I.: You mean you enjoy the challenge of problem solving! Excellent! And how would you rate your interpersonal skills?

A.: I think I'm good at communicating with people. I actively listen to others; adapt my communication style to my clients, show friendliness, confidence, and respect. Also, I have strong problem-solving skills. I can solve problems quickly and effectively, so I'm considered a good mechanic. I mean a have a lot of regular clients.

I.: Fine! And what about your computer skills?

A.: I'm an expert user of MS Word and Excel. I can resolve minor software and hardware problems. Also, I have exceptional internet skills. I can create presentations and that sort of thing. Last year I took a course at uni to learn how to use computer diagnostic equipment. Besides, I keep my own blog about cars and repair on a regular basis.

I.: Sounds great! You have everything we're looking for. Can you start tomorrow?

A.: Yes, sure!

Exercise 11. Look through Unit 1 again. Make a list of the words and word combinations you consider to be the terms. Translate them into Russian.

Unit 2. MAJOR PROS AND CONS OF BEING AN AUTOMOTIVE MECHANIC

Exercise 1. Read and memorize the words and word combinations.

1. advantage преимущество; достоинство; плюс
2. make money зарабатывать деньги
3. passion страсть
4. performance работа (машины)
5. get paid получать зарплату
6. unemployed безработный
7. job prospects перспективы трудоустройства
8. part-time неполный рабочий день, по совместительству, частичная занятость
9. living expenses расходы на жизнь; стоимость проживания
10. indoors внутри помещения

11. extreme weather conditions суровые погодные условия, неблагоприятные погодные условия

12. college degree профессионально-техническое образование

13. high school высшая ступень среднего образования в США

14. student loan кредит на обучение/образование

15. entrepreneurial DNA склонность к предпринимательству; способный реализовывать идеи

16. burn out вымотаться, дойти до предела (из-за нагрузки на работе), перегореть на работе

17. hands-on work практическая работа; физический труд

18. balanced уравновешенный

19. from a psychological perspective с психологической точки зрения

20. mental issue психические проблемы

21. on the side в дополнение к уже имеющемуся

22. affiliate marketing партнёрское соглашение по зависимой рекламе; аффилированный маркетинг

23. maintenance обслуживание

24. rotate tires менять шины по кругу

25. spark plug свеча зажигания

26. bearing подшипник

27. brake pad тормозная колодка

Exercise 2. Read the international words and guess their meanings.

Auto, mechanic, fact, interesting, clients, discuss, real, type, combine, hobby, motivated, qualified, regions, service, technician, electric, industry, extra, profession, balance, career, privilege, comfortable, protected, normal, construction, regular, basis, college, invest, financially, students, finance, finish, contrast, business, start, relaxed, manner, risk, computer, office, classical, system, standard, channels, audience, monetize, natural, calories.

Exercise 3. Read and translate Text 1 about advantages of an auto mechanic career in the USA to get a better impression of what working in this industry really looks like.

Text 1. Advantages of Being an Auto Mechanic

Source: *https://job-evaluator.com/being-an-automotive-mechanic-pros-cons/*

A career as an automotive mechanic can make quite a lot of sense for you for various reasons. Let's consider a few of them.

1. ***Auto mechanics can work with many different people.*** You see many new faces every day and this can be quite interesting since you can talk to people with various social statuses, discuss topics that bother you, get a different view on those things and on the world in general. Moreover, you can make many new connections and some of your clients may even become your really good friends in the long run.

2. ***You can fix a variety of different cars during your career.*** If you have a real passion for cars and really want to fix and improve the performance of cars all day long, an automotive mechanic career is probably the best option for you. You can enjoy the opportunity to fix as many different cars as possible and get paid for that. In fact, you are lucky to combine making money with your hobby and this is a precondition to stay successful and motivated with your job in the long run.

3. ***Good job prospects for auto mechanics right now.*** There is a shortage of qualified mechanics nowadays. Consequently, you can find a job easily in most regions and you

may choose the company to work for. It means it's a secure job where your risk of becoming unemployed is rather low.

4. ***Good automotive mechanics will always be needed.*** The lack of good car mechanics will also be present in the future. In fact, since not many people want to do this job anymore, future job prospects are excellent, especially if you acquire decent knowledge in this field. And if you expand your knowledge regarding electric cars, you'll be in extremely high demand in this industry for a long time.

5. ***You don't have to work long hours as an auto mechanic.*** A car mechanic doesn't have to spend all his life at work like people in many other professions. In fact, most car mechanics work only 40 hours or even less. Automotive mechanics can even work part-time if they really value their time and having enough leisure is more important than making good money.

6. ***Auto mechanics don't have to work in the evening or at night time.*** Car mechanics don't have to work overtime. Normally you will be able to leave your workplace relatively early and will have enough time to spend it with your kids or to meet up with friends after work for a cool drink, etc.

7. ***Auto service technicians have a decent work-life balance in general.*** A career as a car mechanic can be great for you in case you want to enjoy lots of leisure while still making money to pay for your living expenses.

8. ***Automotive mechanics can work indoors.*** Car mechanics enjoy the privilege of working in a rather comfortable protected space indoors in comparison with a lot of people in other professions, for example, construction workers or roofers who have to work outdoors on a regular basis even during extreme weather conditions.

9. ***You don't need a college degree to work as an auto mechanic.*** In the USA one may work as an auto mechanic without a college degree. Consequently, you don't have to spend lots of time and money for your college education but can invest this money into other things you like. Moreover, you'll be able to earn money right after finishing high school and can become independent of your parents rather soon.

10. ***You can avoid student loan debt.*** It's also pretty common in the USA that college students take on student loans to finance their studies. However, since those loans have to be paid back sooner or later, many people have a hard time after finishing college since they are financially constrained and can't afford any big expenses. In contrast, you won't have to deal with these unpleasant things.

11. ***Auto mechanics can start their own business.*** In case you dream about having your own auto mechanic business one day, and if you feel you're ready to work hard and have the entrepreneurial DNA to really pull it off, you can just work as an employed mechanic for a few years, gather some knowledge, save some money and then quit your job and start your own business.

12. ***Working as a car mechanic is not that stressful.*** You'll have a rather relaxed workday. Sure, there may be days when you'll have many clients and things just won't go the right way. However, most of the time, you'll do your work in a pretty relaxed and independent manner. So, you won't have a high risk of burning out at work and will often really enjoy your job.

13. ***You can do hands-on work instead of working in an office job.*** You'll also do lots of hands-on work instead of just sitting in front of a computer all day long like it happens in classical office jobs. Consequently, you'll get some exercise during work, be more balanced from a psychological perspective and have a lower risk of suffering from mental issues.

14. ***Automotive mechanics are important to keep our system running.*** You'll also do a quite important job for society because you'll ensure a high living standard in general. In fact, if they weren't car mechanics, we would be pretty lost in our daily lives since we would just have nobody who could fix issues around our cars. It means we would no longer be able to commute to work or to spend our time as efficiently as we were used to when our cars were broken down.

15. ***You can help out your family and friends on a regular basis.*** You'll be able to help your family and friends to fix their cars or to give proper advice on what car they should buy. Consequently, these people will really appreciate your work and, most likely, they'll help you in other areas.

16. ***You can make lots of money on the side.*** If you want to work hard and don't mind spending extra time after work or at weekends, you can repair additional vehicles to make really good money. Also, you can start your own digital channels where you may give advice on how to fix cars. You'll be able to build a huge audience in the long run and you could also monetize this audience through affiliate marketing or ads.

17. ***You don't need to go to the gym after work.*** Since you'll do hands-on work, you'll exercise in a natural manner. There will be no need for you to go to the gym. In fact, you'll burn many calories during your workday. So, you'll be able to enjoy your time after work with more enjoyable things than going to the gym.

Exercise 4. Read Text 1 again. Look at the list of pros for being an auto mechanic and fill in the gaps with the words given in the box. Are all the statements true for Russia? Have a group discussion.

Work-life, car, long, loan, money, prospects, start, running, indoors, night-time, hands-on, different, gym, fix, college, family, mechanics

1. Auto mechanics can work with many … people.
2. You will … a variety of different cars during your career.
3. Good job ... for auto mechanics right now.
4. Good automotive … will always be needed.
5. You will not have to work ... hours as an auto mechanic.
6. Auto mechanics don't have to work at … .
7. In general auto service technicians have decent ... balance.
8. Automotive mechanics can work … .
9. You don't need a ... degree for working as an auto mechanic.
10. You can avoid student … debt.
11. Auto mechanics can ... their own business.
12. Working as a … mechanic is not that stressful.
13. You can do ... work instead of working in an office job.
14. Automotive mechanics are important to keep our system … .
15. You can help out your ... and friends.
16. You can make lots of … on the side.
17. You don't need to go to the ... after work.

Exercise 5. Which advantages are of paramount importance personally for you as a future auto mechanic? Explain your choice.

Exercise 6. Read and translate the dialogue between an intern and an experienced auto mechanic. Act it out.

Intern: May I ask you a few questions about your work?

Mechanic: Yes, sure. Go ahead! What do you want to know?

I.: What do you do every day?

M.: Well, I work for a car repair shop. I'm an auto mechanic and I have a team of car service technicians. Normally I control the whole repairing process but sometimes I also perform basic maintenance, including changing motor oil, rotating tires and checking fluid levels. Usually, I work in a pretty relaxed and independent manner. I really enjoy it.

I.: And do you have to work at night-time?

M.: No, I don't. I start at 9 a.m. and finish at 6 p.m. So, I leave my workplace quite early and have enough time for my family and friends. My weekends are free, too.

I.: Great! When did you get into the job?

M.: About 15 years ago after graduating from the university. I was an intern like you. I fell in love with my job as soon as I started it. And I still find it very interesting. I even have my own digital channel where I give advice on how to fix cars. It's rather popular!

I.: Cool! Send me a link. I want to subscribe to your channel.

M.: Okay. Just a moment. I've sent it to you.

I.: Fine. I've received it. And what is your favourite part of this job?

M.: I like repairing and replacing the worn parts and systems of cars such as spark plugs, wheel bearings, brake pads, fuel systems and other systems.

I.: Wow. Sounds difficult but exciting! Is your work physically demanding?

M.: Yes, it is. Since I do hands-on work, I exercise a lot in a natural manner! I mean I don't need to go to the gym after work!!!

Exercise 7. Read and memorize the words and word combinations.

1. disadvantage слабая сторона; минус; недостаток
2. retirement удаление от дел; выход на пенсию
3. old-age poverty бедность в старости
4. get evicted лишиться крова; быть выселенным из жилья
5. homeless бездомный
6. health insurance медицинская страховка
7. spine позвоночник
8. be burdened тяготиться
9. struggle with мучиться; испытывать трудности; нелегко даваться; страдать от чего-либо
10. get dirty испачкаться; измазаться
11. be liable нести ответственность
12. mistake ошибка
13. noisy environment среда с высоким уровнем шумов
14. health issues проблемы со здоровьем
15. hearing problems проблемы со слухом
16. work remotely работать в удалённом режиме
17. level of flexibility уровень гибкости
18. commuting ежедневные поездки на работу из пригорода и обратно
19. get stuck увязнуть; погружаться; застревать
20. be reluctant to employ не хотеть брать на работу

Exercise 8. Read the international words and guess their meanings.

Idea, financial, position, industry, region, rent, stress, plan, real, problem, medical,

financially, auto, service, technician, American, mechanic, physically, nature, career, client, reputation, doctor, serious, person, office, regular, basis, expert, company.

Exercise 9. Read and translate Text 2 about disadvantages of an auto mechanic career in the USA.

Text 2. Disadvantages of Working as a Car Mechanic or an Auto Service Technician

Source: *https://job-evaluator.com/being-an-automotive-mechanic-pros-cons/*

In the previous unit we told you about the advantages of being an auto mechanic. But there are also some disadvantages you should know about to get a better idea of the job.

1. ***Auto mechanics don't make good money.*** Becoming a car mechanic doesn't make sense for the money. In fact, many mechanics aren't happy with their job because of bad financial position and regret they don't work as dentists.

2. ***You may even need to get a second job.*** If you live in really expensive regions, you may even need a second job to afford to pay for rent and other basic expenses. Managing two jobs and your private life at the same time can be rather stressful.

3. ***Automotive mechanics often can't save enough money for retirement.*** Due to a relatively low salary, you won't be able to save enough money for retirement. In fact, many auto mechanics suffer from old-age poverty because they don't have any money for a living when they get older and can't work anymore. In the worst case, they may even get evicted and end up homeless with no perspective to get out of their misery at all.

4. ***You may not be able to afford reasonable health insurance plans.*** Many car technicians can't afford proper health insurance. While some of them have rather basic plans that exclude important things, others have no health insurance at all. This can become a real problem in case you need treatment for medical emergency but have no money for it.

5. ***You may not be able to afford your own home.*** Since your salary is rather low, you won't be able to buy your own house or flat. This means that you'll have to rent and will never really be able to live the American dream. This can also become a problem when you get retired because instead of owning a home, you'll still have to pay lots of money for rent.

6. ***Working as an auto mechanic can be physically demanding.*** You should also mind the physical component of the job. In fact, it can be quite demanding and stressful for your body to work with your hands all day long. Also, your spine will be burdened quite often and you may, therefore, often come home extremely tired after work.

7. ***You may struggle with this job once you get older.*** Due to the physical nature of your work, you won't be able to work as an auto mechanic forever. Instead, many mechanics have to quit their jobs once they get older since their bodies are no longer suitable for this kind of work. In this case you won't be able to pay your bills and may really struggle with poverty.

8. ***You will often get dirty during work.*** Another problem with being an auto mechanic is that you will often get dirty at work. Clients often bring cars that aren't clean at all and fixing those cars implies a mess. Hence, don't decide for a career in this field, if it cares how you look at work and when you come home to your family.

9. ***You may be liable for mistakes.*** If you have your own car repair shop and make mistakes, you may also be liable for them and may have to pay your clients large amounts of money. Thus, make sure to get proper insurance to avoid any unpleasant surprises in this regard.

10. ***Rather low social status of automotive mechanics.*** You'll do an important job for society as a car technician, but you won't enjoy the same reputation as doctors or other people who can save lives. Consequently, while many other people will get a certain level of admiration, you won't be appreciated too much.

11. ***You have to work in a noisy environment.*** Since car engines can be quite loud, you will have to work in a rather noisy environment. This can be really annoying. Besides, it can lead to serious health issues and hearing problems in the long run.

12. ***Automotive mechanics are not able to work from home.*** As a car mechanic you won't be able to work remotely from home. Instead, you'll have to be present at work in person and, therefore, you won't be able to enjoy the same level of flexibility as people who work in offices and may work from home on a regular basis. Moreover, you'll have to spend much more time and money commuting.

13. ***You will not learn many skills apart from repairing vehicles.*** You'll become a real expert in fixing cars or other vehicles, but you won't learn many important hard skills that are needed in job market today.

14. ***You may get stuck in this industry.*** Due to your lack of hard skills, you will also have a hard time getting out of the mechanic industry. Most probably, you'll have to work in this field for many years, decades or even for a lifetime since companies in different fields will be reluctant to employ you.

Exercise 10. Read Text 2 again. Look at the list of cons for working as an auto mechanic and fill in the gaps with the words given in the box. Are all the statements true for Russia? Have a group discussion.

Retirement, mistakes, mechanics, struggle, insurance, afford, dirty, good, job, vehicles, status, industry, physically, work

1. Auto mechanics don't make … money.
2. You may even need to get a second … .
3. Automotive mechanics will not be able to save enough for … .
4. You may not be able to afford reasonable health … plans.
5. You may not be able to … your own home.
6. Working as an auto mechanic can be … demanding.
7. You may … with this job once you get older.
8. You will often get … during work.
9. You may be liable for … .
10. Rather low social … of automotive mechanics.
11. You have to … in a noisy environment.
12. Automotive … are not able to work from home.
13. You will not learn many skills apart from repairing … .
14. You may get stuck in this … .

Exercise 11. Make your own list of top 10 pros & cons of being an auto mechanic in Russia. Think of a salary, job prospects, educational requirements, working hours, a job satisfaction, a retirement, a social status, etc. Then, have a group discussion.

Exercise 12. Look through Unit 2 again. Make a list of the words and word combinations you consider to be the terms. Translate them into Russian.

Unit 3. BASIC INTRODUCTION TO AUTO MECHANIC CAREER PATHS AND TOOLS

Exercise 1. Read and memorize the words and word combinations.

1. auto mechanic автомеханик, автослесарь
2. service technician слесарь-ремонтник, специалист по техническому обслуживанию
3. oil level уровень масла
4. ignition system система зажигания
5. fuel consumption расход топлива
6. diagnostic technician специалист по диагностике автомобилей
7. engine двигатель
8. auto body repair technician рихтовщик
9. dent вмятина
10. scratch царапина
11. fender крыло автомобиля
12. headlights передние фары
13. vehicle refinisher специалист по покраске автомобилей
14. damaged поврежденный
15. DIY (Do It Yourself) сделай сам
16. tool инструмент
17. hammer молоток
18. ball peen hammer молоток шпилечный полукруглый
19. rubber mallet резиновый молоток
20. soft-blow mallet молоток с мягким набалдашником на конце
21. dead blow mallet молоток (кувалда) с резиновым набалдашником на конце
22. screwdriver отвёртка
23. Philips head screwdriver крестообразная отвёртка
24. wrench гаечный ключ, вороток
25. open-end wrench гаечный ключ с открытым зевом, гаечный ключ с незамкнутым зевом, обыкновенный гаечный ключ
26. box-end wrench накидной ключ, торцовый гаечный ключ
27. adjustable wrench разводной гаечный ключ
28. pliers пассатижи
29. slip-joint pliers регулируемые двухпозиционные плоскогубцы
30. locking pliers пассатижи с фиксатором, плоскогубцы с зажимом
31. groove-lock pliers плоскогубцы для фиксации пазов
32. needle-nose pliers плоскогубцы с длинными щипцами, остроносые плоскогубцы
33. grip зажим
34. shape форма
35. size размер
36. ratchets and sockets set набор трещоток и головок
37. loosen расстопорить, отвинтить, открутить, ослабить
38. tighten подтягивать, закручивать, затягивать
39. nut гайка
40. fastener фиксатор, соединитель, сцепка, затвор, застёжка

41. long-handled с длинной рукояткой
42. Torx bit набор отвёрточных наконечников для шлицев типа TORX (шестиугольная звёздочка с центральным отверстием)
43. torque wrench динамометрический ключ, торцевой ключ
44. oil filter wrench масляный фильтр, маслоналивной патрубок
45. oil drain pan поддон для слива масла
46. jack домкрат
47. jack stand опора для домкрата
48. lift поднимать
49. wheel wrench баллонный ключ, гаечный ключ для снятия и установки колёс
50. lug nut зажимная гайка, колёсная гайка с конусной фаской для центровки
51. flashlight with a magnetic base фонарь с магнитным креплением/держателем
52. speciality товар специального назначения

Exercise 2. Read the international words and guess their meanings.

Auto, mechanic, automobiles. service, mechanical, electrical, components, centers, technicians, systems, operation, efficiency, diagnose, start, diagnostic, examine, problem, panel, material, finish, techniques, certified, metal, combination, bolt, limit, filter, location, plastic, lift, types, magnetic, base, compact, battery.

Exercise 3. Read and translate Text 1.

Text 1. Auto Mechanics Career Paths

Source: https://ronixtools.com/en/blog/mechanical-tools/

Auto mechanics are in charge of repairing and maintaining different vehicles and automobiles. Depending on their training and experience, they follow various career paths. Some mechanics service and fix a car's mechanical and electrical parts and some others repair vehicles' body components. Mechanics work independently, offering a mobile service and in workshops or repair centers. Here is a basic introduction to auto mechanic jobs and tools needed in this field.

Service Technicians

Service technicians check out and run routine services needed for cars, like checking oil or fluid levels and replacing them, examining important mechanical and electrical parts in a car, checking out fuel and ignition systems operation and efficiency, diagnosing poor starting and decreasing possibly heavy fuel consumption.

Diagnostic Technicians

Diagnostic technicians are similar to service technicians, and their duties almost overlap. They examine and find problems in electrical, ignition, and engine systems. Since the complexity of automotive systems increases daily, diagnostic technicians find more importance.

Body Repair Technicians

Accidents cause dents and scratches in a car's body components like fenders, panels, and headlights. Body repair technicians repair or replace these damaged and worn parts. In case the damage is extensive, the technician decides to repair or replace a component.

Vehicle Refinishers

To improve car appearance, vehicle refinishers may spray booths or refinish the damaged parts. They can also personalize a car using different materials and finishing techniques.

Exercise 4. Answer the questions to Text 1.

1. What career paths may auto mechanics choose?
2. Where can car mechanics work?
3. What do service technicians do?
4. What are diagnostic technicians' responsible for?
5. What do body repair technicians deal with?
6. What are vehicle refinishers' duties?

Exercise 5. Read and translate Text 2.

Text 2. Ten Must-Have Tools for Mechanics

Source: https://ronixtools.com/en/blog/mechanical-tools/

If you are considering DIY automobile maintenance and you want to work on your car, you will need the following essential tools: hammers, screwdrivers, wrenches, pliers, ratchets and socket sets, an oil filter wrench, an oil drain pan, a jack and jack stands, a wheel wrench and a flashlight.

Hammers make you a certified and approved mechanic. As you gain experience, you might need some speciality hammers like ball-peen hammers, rubber, soft-blow or dead blow mallets, etc. Ball-peen hammers are used in the fabrication of metal and precise blow placement. A soft-blow or a rubber mallet is used to deliver a strong blow without damaging the work surface. Dead blow mallets loosen and pull out stuck screws with a few strokes.

A set of different ***screwdrivers***, including flat and Philips head screwdrivers, is highly essential. Mechanics regularly need this set to insert or remove screws with this set of screwdrivers.

Wrenches have a wide variety with different purposes. A set of combination wrenches, including open-end and box-end wrenches, adjustable wrenches in different sizes answer most of your mechanical needs.

A simple set of slip-joint ***pliers***, locking pliers, groove-lock pliers, and needle-nose pliers serve you very well and help you grip whatever you need in every shape and size.

A socket set is a combination of sockets used to loosen and tighten nuts, bolts, and other fasteners. ***Ratchets and sockets*** are available in various sizes; to provide more leverage, buy long-handled ratchets. The use of Torx bits is growing every day; buy an 8-piece set that includes the most commonly used sizes. If you have a lot of engine work to do, a torque wrench is an appropriate tool; torque wrenches are specialty wrenches that limit the torque amount applied.

To carry out oil change maintaining services, you need an ***oil filter wrench***. Oil filter wrenches are made for specific vehicles with a special oil filter size since oil filters are not placed in the same location in all cars.

If you want to change oil in the vehicle, an ***oil drain pan*** is a must. Buy a plastic one that includes a holder to drain the used oil.

Jacks are used to lift and hold a vehicle, and they enable the mechanic to work underneath a car. For every operation, even a simple oil changing, you need to lift the car front. Remember to use jack stands with the jack to support it and increase your job safety.

To remove all wheels from light-duty vehicles, you need ***wheel wrenches***. Buy a 4-way wheel wrench that fits all types of lug nuts.

To light up dark areas, you need a ***flashlight***. Buy a flashlight with a magnetic base to prevent tying up your hands on the job site. Choose a compact one to fit in tight areas with a rechargeable battery for living a long life.

Exercise 6. Answer the questions to Text 2.

1. What are ten must-have tools for DIY mechanics?
2. What can each of the mentioned in the text tools be used for?

Exercise 7. Match the terms (1-7) to their definitions (a-g).

1. A wrench	a. Механизм, служащий для облегчения ремонта и обслуживания транспортных средств, который предназначен для подъёма и удержания автомобилей в поднятом положении на определённой высоте
2. An oil drain pan	b. Ударный ручной инструмент, применяемый для забивания гвоздей, разбивания предметов и других работ.
3. A jack	c. Ручной инструмент, захватывающие губы которого плоские и имеют в большинстве своем насечки на рабочей поверхности. Этим инструментом удобно осуществлять захват различных предметов, металлических листов, проволоку, изгибать, удерживать, извлекать и выполнять другие работы
4. A screwdriver	d. Специальная углубленная конструкция, предотвращающая вытекание масла при его замене
5. A hammer	e. Инструмент для соединения или рассоединения резьбового соединения путём закручивания (раскручивания) болтов, гаек и других деталей
6. Pliers	f. Осветительный прибор
7. A flashlight	g. Ручной слесарный, монтажный инструмент, предназначенный для завинчивания и отвинчивания крепёжных изделий с резьбой

Exercise 8. Work in pairs, one of you is a salesclerk and the other is a client. Read and translate the dialogue based on ideas from Text 2. Act it out.

Salesclerk: Hello! How can I help you?

Client: Hi! Can you tell me where the hand tools are?

S.: Sure. This way, please. What are you looking for?

C.: Well, I'd like to buy some tools to do basic maintenance and fix some minor problems in my car.

S.: I see. We can offer you a good choice of hammers, screwdrivers, wrenches, pliers, ratchet and sockets sets, jacks and flashlights.

C.: Oh, nice. But I've already bought a ratchet and sockets set, a few pliers, a jack and a couple of hammers. And I have a set of wrenches, too. So, I need some screwdrivers and a good flashlight.

S.: Okay. Do you want a full set of screwdrivers or individual ones?

C.: Oh, I think individual screwdrivers will be fine. I only need a few sizes for my car. What can you recommend?

S.: We've got a large range of screwdrivers but it's rather expensive to buy them separately. I'd recommend you to buy a full set. Have a look at this one! It has a very good quality and a reasonable price.

C.: Okay, I'll take it. And what about flashlights?

S.: Well, I'd like to recommend you the models with a magnetic base and a rechargeable battery.

C.: Okay. But why those models?

S.: Flashlights with a magnetic base are very convenient because they allow your hands to be free on the job site. And a rechargeable battery will secure a long life for your flashlight. This one is the best-seller.

C.: Fine. I'll buy it as well. Thanks a lot for your help!

S.: You're welcome. We'll be glad to see you again!

Exercise 9. Look through Unit 3 again. Make a list of the words and word combinations you consider to be the terms. Translate them into Russian.

Unit 4. GENERAL AND INTERMEDIATE TOOLS

Exercise 1. Read and memorize the words and word combinations.

1. basic основной; базовый; главный
2. tool инструмент
3. quintessential наиболее типичный
4. aspiring начинающий, пробующий свои силы, целеустремлённый
5. hand tools слесарно-монтажный инструмент; ручной инструмент
6. diagnosis and troubleshooting tool инструментарий обнаружения и устранения неисправностей
7. garage tool гаражный инструмент
8. supplies расходные материалы
9. protection средства защиты
10. lighting осветительная аппаратура; средства освещения
11. wrench гайковёрт; гаечный ключ; динамический винт
12. tightening затягивание; подтягивание; закручивание; завинчивание
13. loosening ослабление; отвинчивание; откручивание
14. rotating вращающийся; поворачивающийся
15. fastener крепёжная деталь, деталь крепления
16. nut гайка
17. screw винт; болт; шуруп
18. chrome vanadium alloy хромованадиевый сплав
19. metric метрический
20. ratchet трещотка
21. socket (торцевая) головка
22. fit tightly плотно садиться; плотно входить; плотно охватывать; соединяться (о двух деталях) по тугой посадке
23. enclose заключать; охватывать
24. drive handle ручка; рукоятка; рычаг управления
25. screwdriver отвёртка
26. unscrewing вывинчивание; выкручивание; отвёртывание, отвинчивание
27. slot щель; паз; прорезь; отверстие; шлиц
28. screw head головка болта или винта
29. tip of the screwdriver наконечник отвёртки; рабочий наконечник
30. flat head screwdriver отвёртка с плоским шлицем; отвёртка под винт с плоской головкой; плоская отвёртка; плоскошлицевая отвертка
31. Philips head screwdriver отвёртка с крестообразным шлицем; крестовая отвертка

32. Allen head screwdriver отвёртка с шестигранным шлицем (Аллен); шестигранная отвёртка
33. Torx head screwdriver отвёртка с звездообразным шлицем (Torx); «звёздочка»
34. ratchet screwdriver отвёртка с храповым механизмом
35. replaceable сменный; заменяемый; съемный
36. slider слайдер; ползунковый или движковый переключатель
37. pliers клещи; плоскогубцы; пассатижи; кусачки
38. bend изгибать; гнуть
39. clamp зажимать; закреплять; фиксировать
40. lever рычаг
41. handle ручка, рукоятка
42. jaw захватные губки; плоские губки с насечками
43. electric connector электрический соединитель
44. wire-cutting для зачистки проводов и резки проволоки
45. combination pliers универсальные плоскогубцы; комбинированные кусачки; пассатижи
46. cutting pliers плоскогубцы-кусачки; острогубцы с боковыми режущими губками
47. locking pliers пассатижи с фиксатором; плоскогубцы с зажимом
48. crimping pliers обжимные щипцы; опрессовочные клещи
49. hammer молоток
50. move двигать, передвигать, перемещать; изменять положение
51. deform деформировать; разбивать; изменять форму
52. blow удар
53. brake тормозной механизм; тормоз
54. suspension подвеска
55. grease смазка
56. rust коррозия; ржавчина
57. hard steel закалённая сталь
58. hammer head головка молотка
59. rubber резина; каучук; резиновый; каучуковый
60. brass латунь
61. copper медь
62. handle рукоятка (молотка)
63. good grip удобный захват (инструмента в руке)
64. club hammer молоток с заострённым бойком; кувалда
65. oil filter маслоочиститель, масляный фильтр
66. oil filter wrench ключ для снятия и установки автомобильных масляных фильтров
67. adjustable регулируемый; настраиваемый
68. zip wrench гаечный ключ с фиксированной настройкой
69. three jaw wrench трехкулачковый регулируемый ключ
70. funnel раструб, воронка
71. spill проливание, разливание (жидкости); пролитая жидкость
72. odour запах (обычно неприятный)
73. coolant охлаждающая жидкость; охладитель; хладагент
74. scissors ножницы
75. zip tie пластиковый хомутик

76. electrical tape изолента
77. hex wrench шестигранный ключ
78. Allen headed bolt болт/винт с внутренним шестигранником
79. inaccessible недоступный, труднодоступный
80. Allen head socket торцевая шестигранная головка
81. multimeter многофункциональный электроизмерительный прибор, мультиметр
82. voltage вольтаж, электрическое напряжение
83. resistance сопротивление, активное сопротивление
84. amperage сила тока (в амперах)
85. battery батарея, аккумуляторная батарея; батарейка
86. fuse предохранитель, плавкий предохранитель
87. jack домкрат; подъёмное приспособление
88. lift поднимать
89. installation site монтажная площадка
90. wheel replacement set комплект для замены колёс
91. jack stand опора для домкрата
92. ramp эстакада
93. bulky большой, объёмистый; громоздкий, занимающий много места
94. oil dripping pan масляный поддон
95. gearbox oil смазочное масло для коробки передач; трансмиссионное масло
96. assorted смешанный, разных видов/размеров
97. storage box коробка для хранения
98. electrical issue неисправность, связанная с электрикой
99. blown fuse перегоревший предохранитель
100. troubleshoot отыскивать неисправности, диагностировать, устранять неполадки
101. replacement замена
102. amp (ampere) ампер
103. electrical-resistant с высоким электрическим сопротивлением
104. vinyl tape виниловая клеющая лента
105. control орган управления; элемент системы управления
106. brake cleaner очиститель тормозов
107. brake fluid тормозная жидкость
108. hard требующий усилий, напряжения
109. joint соединение; шарнир
110. kick-start запускать; заводить
111. hand cleaner очищающее средство для рук
112. fingernail ноготь
113. gloves перчатки
114. disposable одноразовый; предмет одноразового использования
115. rip рваться
116. handyman мастер на все руки
117. nitrile нитрил; нитриловый
118. in-and-out operations работы снаружи и внутри
119. LED headlamp светодиодный головной фонарик
120. durable надёжный, прочный, долговечный, длительного пользования
121. come in handy пригодиться

Exercise 2. Read the international words and guess their meanings.

Basic, quintessential, professional mechanic, enthusiast, fix, problem, category, garage, recommend, invest, chrome, vanadium, metric, standard, accuracy, millimetre, characterize, Phillips, regular, electric connector, rotor, industrial, filter, absolute, really, efficient, mechanic procedure, gas, manufacturer, bolts, electrical diagnosis, voltage, resistance, amperage, battery, audio, multimeter, process, hydraulic, lifting, transmission, operation, collect, recommended interval, gallons, assorted, vinyl, electronics, stereo, control, spray, interior, serious, nitrile, latex, chemicals, comfortable, lamp.

Exercise 3. Read and translate the text about general tools.

Text 1. Basic Tools

Information sources: https://gear4wheels.com/auto-mechanic-tools-list/, https://autoedu.info/en/equipment-and-tools/tools/, https://autoedu.info/en/equipment-and-tools/workshop-equipment/

Basic tools are the quintessential tools for any DIY home mechanic, aspiring professional mechanic or car enthusiast that wants to do basic maintenance and fix the vast majority of minor problems in his or her car. Having this set of tools, you will be able to do 99.9% of jobs in any car or truck. The tools are put in the following categories: hand tools, diagnosis and troubleshooting tools, garage tools, garage supplies and protection, lighting.

Category: Hand Tools

A ***wrench*** is used for tightening and loosening rotating fasteners such as nuts and screws, so a set of wrenches is a must in any tool box. We recommend investing in chrome vanadium alloy tools as they last for a lifetime. Metric wrenches are better than standard ones. The metric ones go from 6mm up to any crazy size you may think about. Usually, having them in sizes up to 21-24mm is enough. A set of a ***ratchet and sockets*** has three different sizes of ratchets: ¼ (small), ⅜ (medium), and ½ (large). There are sets with all three or just one size with sockets of all kinds, or just the basic ones. The ***socket*** fits tightly into the nut and encloses it at all six corners. Each socket corresponds to a nut or screw of a certain size. It's good to have a set of them in sizes from 6mm up to 24mm and a single one of 32mm. The ***ratchet*** is the drive handle through which the rotation is transmitted to the socket. This handle makes it easy to tighten or loosen the nut with little force. A ***screwdriver*** is used for unscrewing and tightening screws. The screwdriver is selected according to the type of slot on the screw head. The tip of the screwdriver should have the same shape as the slot on the screw head. The most common are Flat, Phillips, Allen and Torx head screwdrivers. It's better to buy a set of screwdrivers. A ***ratcheting screwdriver*** consists of a ratchet and a set of replaceable, screwdrivers. There is a slider direction menu on the screwdriver. Depending on the slider position, a screwdriver can unscrew or tighten the screw. The set contains sockets of different shapes and sizes. ***Pliers*** are designed to hold, cut, bend and clamp. They consist of a pair of metal levers connected at one point. There are handles on the longer end of the lever, and the jaw on the shorter side. Various forms of jaws define the purpose of the pliers. They are used in most jobs – from brake jobs to removing small electric connectors. There are combination pliers, cutting pliers, locking pliers, crimping, and many other types of pliers for special purposes. Buy different ones. A ***hammer*** serves to move or deform an object with strong blows. Especially it helps when we work with brakes and a suspension, where things often get stuck with dirt, grease and rust. Depending on the purpose, there are hammers of different shapes and materials. There are hammers with a hard steel hammer head and soft hammers made of rubber, plastic, brass, or copper. Look for a nice rubber handle to ensure a good grip. If you work with

big industrial vehicles, you may want to consider getting a ***club hammer***, too. An ***oil filter wrench*** of any kind is an absolute must when we need to change oil. It is used to remove the oil filter from the engine. These wrenches are available in various designs and sizes, and some are adjustable to fit many filter sizes. Oil filters tend to get really stiff and it's usually almost impossible to remove them by hand. We believe that zip wrenches and three jaw wrenches are the most efficient. ***Funnels*** are a simple and extremely helpful tool. Whenever we have to pour liquids during any mechanic procedure, a funnel will help us to avoid spills. They are especially useful during oil changes because oil spilled around the engine made it dirty, causing odours and gases. Buy a set of a few different sizes. Keep and use the funnels for coolant or water separately from the ones for oil. A nice pair of sharp ***scissors*** comes in handy to cut zip ties, electrical tape, wires, etc. Sets of ***hex wrenches*** are usually cheap and we recommend buying the metric ones. Manufacturers have a passion for hiding Allen headed bolts in the most inaccessible spots. As a rule, the Allen head socket from a ratchet set can't reach such bolt. So, you can do well with a good old hex wrench.

Category: Diagnosis and Troubleshooting Tools

The ***multimeter*** is essential for electrical diagnosis and troubleshooting. It allows measuring the voltage, resistance and amperage. It is extremely useful to check batteries, fuses, work on a car audio, etc. The multimeters range from cheap to extremely expensive ones. We advise you to buy the one of decent quality as you will give this tool a lot of use.

Category: Garage Tools

A ***jack*** is used to lift a part of the vehicle off the ground or to lift heavy components to the installation site. The most famous vehicle's emergency jack is part of the wheel replacement set. A jack is only used to lift the vehicle so that it is then carefully lowered onto the appropriate ***jack stands***. There are three main types of jacks: hydraulic, pneumatic, and mechanical. Buy the one that withstands at least 2-3 tons of weight. Good jacks can be a bit pricey, so you may use the mechanical jack that comes with a car or you may use ramps. ***Ramps*** lift the car up in a secure way. Even the cheapest ones do fine. They're bulkier than jack stands. And they don't allow wheels to move. So, they're great for an oil change but absolutely useless for brake or suspension jobs. An ***oil dripping pan*** is another essential thing for oil changes of any kind (engine oil, transmission oil, gearbox oil, etc.), if you want to perform oil-related operations in a clean and environmentally friendly way. It allows you to collect the used oil and help keeping your garage clean from dangerous oil spills. If you change your engine's oil according to the recommended oil change interval, you will have around 2-3 gallons of used oil per year depending on how much you use your car.

Category: Garage Supplies and Protection

Assorted fuses with a storage box are very cheap. All the drivers have faced some electrical issue caused simply by a blown fuse. It can be troubleshot quickly with a multimeter and some fuses for replacement. Buy a box that comes with 5-, 7.5-, 10-, 20- and 30-amp fuses. Medium size fuses are the most common. An ***electrical-resistant vinyl tape*** is one of those little things that many forget to have around until it's needed. You use it to put some wires together while repairing lightning, car electronics such as a car stereo or other controls. A ***brake cleaner spray*** is good for cleaning brakes from any dangerous grease or brake fluid. It may clean almost any unwanted grease, except the ones on the interior parts. It can clean super hard joints and even may help to kick-start old engines. A ***hand cleaner*** isn't really necessary although quite useful. If you really get serious about

fixing cars, you'll get dirty. Even a simple oil change leaves your fingers all black around the fingernails and smelling like hell. Even with gloves. Disposables tend to get ripped quite easily. A hand cleaner can help you and it smells nice too! We always recommend having high-quality disposable or non-disposable ***mechanic gloves*** if you're a professional or an everyday handyman. We're very fond of disposable nitrile gloves for quick in-and-out operations or when working on car interiors where old mechanic gloves can leave some grease traces. I don't advise going for latex ones as they are less resistant against chemicals. Save your hands!

Category: Lightning

When we work in our cars, visibility isn't always nice. It's comfortable to work with ***LED headlamps***. They are small, inexpensive and durable.

Exercise 4. Answer the questions.

1. What categories of basic tools for car mechanics can you name?
2. What hand tools do you know?
3. What sizes wrenches should you buy?
4. What are the common sizes of ratchets and sockets in a ratchet and sockets set?
5. What are the most common types of screwdrivers?
6. What are the pliers used for?
7. When is a hammer needed?
8. Why is an oil filter wrench an absolute must?
9. Why is it necessary to have a few funnels?
10. What does a pair of scissors come in handy?
11. What do you need hex wrenches sets for?
12. What does a multimeter allow measuring?
13. What are jacks and jack stands used for?
14. What are the advantages and disadvantages of ramps?
15. What role does an oil dripping pan play?
16. Why should drivers have a set of assorted fuses?
17. Why is it useful to have an electrical-resistant vinyl tape?
18. What is a brake cleaner spray good for?
19. How can a car mechanic apply a hand cleaner?
20. Why is it recommended wearing mechanic gloves while working on car interiors?
21. What device can improve lighting?

Exercise 5. Match the tools (1-5) to the categories (a-e).

1. Jack and jack stands, ramps, oil dripping pan	a. hand tools
2. Hand cleaner, brake cleaner spray, gloves, fuses, electric tape	b. diagnosis and troubleshooting tools
3. Multimeter	c. lighting
4. Scissors, hammer, wrenches, ratchet and sockets, funnel, pliers, screwdrivers, hex wrench, oil filter wrench	d. garage supplies & protection
5. LED Headlamp	e. garage tools

Exercise 6. Look through Text 1 again and make a list of car mechanics' basic tools. Say a few words about each of them. See also the information in 2.2. Tools and Measuring Equipment for Service Stations and Car Workshops.

Exercise 7. Match the verbs in English from Text 2 (1-15) to their Russian equivalents (a-o).

1. tighten	a. рыскать; водить в поисках чего-либо
2. loosen	b. плавно подкатиться под что-либо
3. roam	c. сжимать; сдавливать
4. read	d. промывать; прокачивать (жидкость)
5. erase	e. сохранять
6. glow	f. затягивать; закручивать; завинчивать
7. get underneath	g. демонтировать; разбирать (двигатель); повредить; сорвать (резьбу)
8. slide	h. стирать, удалять, уничтожать
9. flush	i. заменять
10. pump	j. ослаблять; раскручивать; отпускать
11. strip	k. устранять
12. replace	l. накачивать; подкачивать
13. keep	m. считывать (код)
14. eliminate	n. залезать под (автомобиль)
15. compress	o. светиться; сверкать, быть ярким, светлым

Exercise 8. Match the terms in English from Text 2 (1-20) to their Russian equivalents (a-t).

1. repair	a. хромованадиевый сплав
2. storage	b. поиск и устранение неисправностей
3. adapter	c. предохранительное/защитное устройство
4. chrome vanadium alloy	d. адаптер; соединительное устройство; регулятор; держатель; переходная деталь, переходник
5. door panel	e. пружинное стопорное кольцо
6. troubleshooting	f. торцевая головка
7. air conditioning stuff	g. программное обеспечение, программные средства; софт
8. dashboard	h. трещотка
9. stereo unit	i. реле
10. circlip	j. официальный дилер
11. software	k. коррозия; ржавчина
12. authorized dealership	l. соединитель; соединительная деталь; коннектор
13. relay	m. цилиндр
14. connector	n. хранение; складирование
15. piston	o. стерео; стереосистема
16. cylinder	p. оборудование для кондиционирования воздуха
17. socket	q. дверная панель
18. rachet	r. поршень; плунжер
19. rust	s. ремонт
20. safeguard	t. приборная доска; панель приборов; приборная панель

Exercise 9. Read and memorize the words and word combinations from Text 2.

1. intermediate tools полупрофессиональные инструменты; инструменты специального назначения
2. complex комплексный, сложный
3. specialty tools специальные инструменты
4. power tool механизированный инструмент, приводной инструмент
5. heater нагреватель; обогреватель; отопитель; печь; калорифер; радиатор
6. wire terminal crimper пресс-клещи
7. electric repair ремонт электрооборудования
8. torque wrench торцевой ключ
9. torque вращающий момент, сила кручения
10. transmission gear передаточный механизм; промежуточный привод; зубчатое колесо коробки передач
11. spark plug свеча зажигания
12. Torx wrench ключ-звёздочка
13. Torx socket торцевая головка Torx/звёздочка
14. high-quality высококачественный
15. bad quality низкое качество; плохое качество
16. wrecking bar монтажный/загнутый лом
17. stubborn неподатливый
18. overly-attached чересчур закреплённый
19. ball joint шариковый шарнир; шаровой палец; шаровая опора
20. shock absorbers head головка для снятия стойки амортизатора
21. pry bar лапчатый лом; гвоздодёр; монтировка
22. breaker bar длинный торцевой ключ
23. molding removal tool set набор формованного инструмента для демонтажа
24. clip крепление; деталь крепления; зажим, фиксатор
25. power window switch выключатель управления электрическим стеклоподъёмником дверей
26. speaker динамик, громкоговоритель; колонка, акустическая система
27. circlip pliers щипцы для пружинных стопорных колец, клещи для снятия и установки стопорных колец
28. fastener крепёжная деталь, деталь крепления; зажим; соединитель
29. retaining ring стопорное кольцо
30. hose clamp pliers плоскогубцы для работы с хомутами шлангов
31. hose clamp зажим шланга; хомут шланга
32. grip зажимать; захватывать
33. flexible гибкий, подвижный, гнущийся; удобный для применения
34. magnet pickup магнитный датчик (для поиска и захвата металлических предметов)
35. restricted space ограниченное пространство
36. access доступ; подход
37. bread and butter кусок хлеба
38. abyss бездна, пропасть, пучина
39. nook угол(ок); закоулок; удалённое место; труднодоступное место
40. hidden spot скрытый участок
41. frustration чувство разочарования, неудовлетворённости (из-за невозможности каким-л. образом повлиять на ситуацию)

42. ‘Engine Check’ warning light сигнальная лампочка «Проверить двигатель»
43. OBD2 Scanner OBD-2 сканер, сканер к диагностическому разъему OBD-2
44. ABS (antilock braking system) АБС, антиблокировочная тормозная система
45. brand-specific разработанный для конкретного бренда; ориентированный на определённый бренд
46. code reader устройство считывания кода
47. full-blown полнофункциональный; полноценный
48. trouble code код неисправности
49. ignition spark tester прибор для проверки искры зажигания
50. rubber boot резиновый чехол
51. tester boot контактная деталь (напр. датчика, тестера)
52. carton картонная коробка
53. car Z-creeper seat складное ремонтное сиденье-подкатной лежак
54. wire connector соединитель проводов
55. trunk багажник
56. messy захламлённый; набросанный в беспорядке
57. rolling tool chest ящик для инструмента на колесиках
58. fully equipped полностью оборудованный; полностью оснащенный
59. brake bleeder & vacuum pump клапан прокачки тормозной системы и вакуумный насос
60. cylinder piston rings compressor приспособление для сжимания поршневых колец (при установке поршня в цилиндре)
61. corroded проржавевший; разрушенный коррозией; корродированный; ржавый
62. external agent внешний фактор
63. malfunction отказ; неисправная работа; неисправность; сбой
64. healthy исправный
65. heat shrink tube термоусадочная трубка
66. brake fluid тормозная жидкость
67. brake bleeder клапан прокачки тормозной системы
68. vacuum pump вакуумный насос
69. manifold коллектор; сборник
70. cylinder piston поршень цилиндра
71. rings compressor приспособление для сжимания поршневых колец (при установке поршня в цилиндре)
72. kit набор; комплект
73. piston ring поршневое кольцо
74. bearing adapter kit набор переходников подшипника
75. front wheel bearing adapters адаптеры для подшипников передних колес
76. wheel bearing подшипник колеса
77. steering knuckle поворотный кулак
78. strut assembly амортизационная стойка в сборе с пружиной
79. on the vehicle на транспортном средстве
80. front end alignment выравнивание передней части
81. lubrication смазка, смазывание
82. thread резьба
83. socket adapter адаптер; переходная панель; переходник
84. cordless drill беспроводная дрель
85. customization удовлетворение требований заказчика, настройка, изменение

внешнего вида или изготовление (адаптация) продукта по требованиям (техническим условиям) заказчика

86. angle grinder угловая шлифмашина
87. grinding шлифование
88. sanding очистка песком; пескоструйная очистка; зачистка шлифовальной шкуркой
89. polishing полировка, полирование
90. drastic measures решительные меры, кардинальные меры
91. exhaust line выхлопной трубопровод
92. metal-cutting резание металлов; обработка металлов резанием
93. repair shop ремонтная мастерская
94. metal sheet металлическая пластина, металлический лист
95. portable переносной; портативный
96. spark искра
97. direct направлять
98. protection guard защитное приспособление
99. eye protection средства защиты органов зрения
100. ear protection средства защиты органов слуха; защитные наушники

Exercise 10. Read the international words and guess their meanings.

Specific, complex, categories, adapters, garage, region, electric, bolts, operation, transmission, object, shock, absorb, provide, panel, plastic, stereo, specific manufacturer, designed, type, compress, refrigerator, circuit, magnet, model, scanner, code, dollars, brand-specific, software, dealer, test, tester, carton, garage, comfortably, comfort, dramatically, start, regularly, investment, mini, chaotic, collection, organized, special, corroded, agents, component, relay, sensors, bucks/dollars, vacuum, cylinder, compressor, adapter, recommend, invest, audio, polishing, situations, accurate results, basically, metal, portable version.

Exercise 11. Read and translate the text using word-lists from Ex. 1-4. Match the Parts 1-4 of the text with their titles (a-d).

Part 1	a. Category: Garage Tools
Part 2	b. Category: Storage
Part 3	c. Category: Hand Tools
Part 4	d. Category: Diagnosis and Troubleshooting Tools

Text 2. Intermediate Tools

Source: https://gear4wheels.com/auto-mechanic-tools-list/, https://ronixtools.com/en/blog/essential-cordless-tools-for-mechanics/, https://autoedu.info/en/equipment-and-tools/tools/

Intermediate tools are more specific sets of tools for more complex repairs. Besides the categories mentioned in the previous unit, we added the storage, specialty tools, adapters and power tools. Additionally, if you spend a lot of time working on your car, you may want to consider getting a garage heater if the winters in your region are harsh.

Part 1

A ***wire terminal crimper*** is a multi-purpose tool. It is designed to conduct electric repairs. A ***torque wrench*** is used to tighten bolts at exactly the specified torque given by the manufacturer. It's necessary for conducting operations inside the engine or the transmission

gear or for tightening the spark plugs. A ***torx wrench (set)*** fits where a torx socket doesn't. These sets aren't expensive. Buy only good-quality sets because the small-sized torx wrenches of bad quality can be broken easily. A ***wrecking bar*** can be used to loosen stubborn objects. For example, overly-attached ball joints and shock absorber heads. When the job is not so hard, it's enough to use ***a pry bar***. A ***breaker bar*** is very useful as it provides with greater torque, helping with hard bolts. The longer, the more powerful. Buy the ones made of chrome vanadium alloys. A ***molding removal tool set*** is very cheap and tremendously useful. This set helps to remove door panels with ease and without breaking all those clips that hold the panel against the door itself. Whether you replace a power window switch, change the speakers in your car or just troubleshoot some air conditioning stuff on the dashboard, these little plastic things make your life much easier. Also, it can be used to remove stereo units when the specific manufacturer tool isn't needed. ***Circlip pliers*** are designed for installing or removing a circlip which is a type of fastener that works like a retaining ring. ***Hose clamp pliers*** are a very specific kind of pliers used to grip hose clamps making them easier to remove. A ***flexible magnet pickup*** can be useful. Working in restricted spaces with difficult access is our bread and butter. Sometimes, that bolt that you are barely holding with one finger whilst trying to get it on place, falls down to the abyss of the engine's darkest nooks. Use the flexible magnet pick-up to roam around those hidden spots until the missing bolt sticks to the magnet. It can save you uncountable hours of frustration.

Part 2

Do you want to know why that 'Engine Check' warning light is on? Troubleshooting gets so much easy with an ***OBD2 Scanner***. The first models of the scanners could only read codes and cost a fortune. Luckily, in 2019 good OBD2 scanners at a price of around a hundred dollars appeared. They could read, scan and erase the engine and ABS codes. Some are brand-specific, some are 'read only' and some can do it all, just like the software used at authorized dealerships. We advise you to do your research when you purchase one of these tools. In our opinion, either get a $30 code reader, or a full-blown scanner that will not only tell you what trouble code you have, but what it means, how to fix it, allow you to test parts in your car, etc. An ***ignition spark tester*** helps to check if there is a spark or not. It is one of the main reasons a car's engine might not start. Simply remove the rubber boot from spark plug, insert tester and place tester boot on plug. Turn the engine, if it glows, you've got spark and can move forward.

Part 3

We all know that if we need to get underneath our car, the top of some old cartons is okay. But why don't you get a ***car Z-creeper seat***? This garage tool works both as a seat and then extends to be a full, flat creeper to slide under your car comfortably. Cool right? They aren't very expensive and once you get one, the comfort with which you work will improve dramatically. As soon as you start working regularly on cars, this is an essential investment.

Part 4

Tools are added up and soon you notice that you have your trunk full of mini boxes with small sets of wrenches, screwdrivers, fuses... in your garage you have a messy table full of expensive tools. It starts to get a bit chaotic and hard to find everything when you need it. If you want to keep your tool collection nicely organized, you may want to get yourself a special ***rolling tool chest*** for storing tools. There are some cheap ones. There are also fully equipped tool chests. So, you may choose what you really need.

Category: Garage Supplies

Wire connectors are the terminals. They are sold in sets. Terminals in a car tend to get corroded under the impact of external agents. Some may cause malfunction of compo-

nent. When you conduct reparation in some component and take out relays and connectors and sensors... sometimes you notice some terminals are gone. A smart thing to do is to replace them quickly with a healthy one. A box of assorted terminals usually costs just a few bucks and comes in handy when you need it. Make sure to buy good quality ones with heat shrink tube.

Category: Specialty Tools

Flushing old brake fluid and performing a brake fluid change without this tool is a beautiful nightmare in which you have to come in and out the vehicle, pump, open, close... almost impossible without someone else helping you. With a ***brake bleeder and vacuum pump***, the job is incredibly easy. It can also be used to measure vacuum on the manifold. A ***cylinder piston rings compressor*** is another kit for a very specific purpose. If you strip an engine, you'll have to get one of these to get the piston rings and the piston inside the cylinder. It's usually cheap and comes in many sizes fitting most pistons. A ***bearing adapter kit*** includes front wheel bearing adapters. They replace wheel bearings keeping at the same time the steering knuckle and the strut assembly on the vehicle, eliminating the need for front end alignment after the work is done. These tools require proper lubrication prior to use, as the threads are usually easy to strip.

Category: Adapters

Socket adapters aren't used every day, but they are a smart, inexpensive addition to your tool box. Sometimes you have the socket that you need but the ratchet won't fit in the space you have. Sometimes the only socket that fits is from the small ratchet and the torque isn't enough for you to move it.

Category: Power Tools

A million and a half uses can be given to a ***cordless drill***. We recommend investing on a good one, especially if you do a lot of jobs in car audio or customizations in general. An ***angle grinder*** is designed for grinding, cutting, sanding, and polishing. When things get ugly and you have to take drastic measures it is especially useful. It can be used for working on exhaust lines or any other metal-cutting works. You may not see it in a garage or repair shop all the time, but there are many situations when it is needed. It's commonly used for removing rust or old paint. There are different sizes of discs for this action to have the most accurate results. Since the angle grinder is basically made for cutting metal, the other purpose of it is cutting out metal sheets, such as different parts of a car. A portable version of the angle grinder allows having more control during the process. The angle grinder can throw sparks, so direct the sparks in a safe direction or install a protection guard. Use eye and ear protection when grinding, as it is very noisy and can damage your hearing. Don't forget to wear gloves when operating it.

Exercise 12. Answer the questions.

1. What are the categories of the intermediate tools?
2. What tool do you need to conduct electric repairs?
3. What tool is used to tighten bolts at the torque given by the manufacturer?
4. Why is it advised to buy high-quality torx wrench sets?
5. What can a wrecking bar be used for?
6. What kind of bar is useful to deal with hard bolts?
7. What kind of tool set do you need to remove door panels?
8. What are circlip pliers designed for?
9. Why are hose clamp pliers regarded as specific ones?
10. Why can a flexible magnet pickup be useful?

11. What can an OBD2 Scanner do?
12. What can be checked with the help of an ignition spark tester?
13. Why is a car Z-creeper seat regarded as an essential investment?
14. What role does a rolling tool chest play?
15. Why is it a good idea to have a set of wire connectors?
16. What is a brake bleeder and vacuum pump used for?
17. What is the specific purpose of a cylinder piston rings compressor?
18. What do front wheel bearing adapters replace?
19. Why are socket adapters needed?
20. Which power tool has more than million uses?
21. What are the main usages of an angle grinder?

Exercise 13. Match the tools in English (1-20) to their Russian equivalents (a-t).

1. angle grinder	a. клещи для снятия и установки стопорных колец
2. bearing adapter kit	b. монтажный/загнутый лом
3. breaker bar	c. прибор для проверки искры зажигания
4. brake bleeder & vacuum pump	d. приспособление для сжимания поршневых колец
5. car Z-creeper seat	e. плоскогубцы для работы с хомутами шлангов
6. circlip pliers	f. сканер к диагностическому разъему OBD-2
7. cordless drill	g. набор формованного инструмента для демонтажа
8. cylinder piston rings compressor	h. складное ремонтное сиденье-подкатной лежак
9. hose clamp pliers	i. длинный торцевой ключ
10. ignition spark tester	j. ключ-звёздочка
11. magnet pickup	k. торцевой ключ
12. molding removal tool set	l. угловая шлифмашина
13. OBD-2 Scanner	m. соединитель проводов
14. pry bar	n. набор переходников подшипника
15. rolling tool chest	o. беспроводная дрель
16. torque wrench	p. пресс-клещи
17. Torx wrench	q. клапан прокачки тормозной системы и вакуумный насос
18. wire connector	r. лапчатый лом; гвоздодёр; монтировка
19. wire terminal crimper	s. магнитный датчик
20. wrecking bar	t. ящик для инструмента на колесиках

Exercise 14. Look through Text 2 again and make a list of about 5-10 intermediate tools. Say a few words about each of them. See also 2.2. Tools and Measuring Equipment for Service Stations and Car Workshops.

Exercise 15. Work in pairs, one of you is a shop assistant and the other is a client. Read and translate the dialogue based on ideas from Text 1. Act it out.

A: Hello! Is there anything I can help you with?
B: Hi! Yes. Can you tell me where the garage tools are?
A: Sure. This way, please. What exactly are you looking for?
B: I need a car creeper to slide underneath my car.
A: Well, we have a few car creepers but why don’t you get a Z-Creeper seat?

B: Oh, what's this?

A: Here is one of such models. Have a look! It works both as a seat and then extends to be a full, flat creeper to slide under your car comfortably.

B: Fine! This is what I am looking for. I'll take it.

A: Good choice! I am sure you'll enjoy using it!

Exercise 16. Make similar dialogues about other tools from Text 2. Act them out.

Exercise 17. Look through Unit 4 again. Make a list of the words and word combinations you consider to be the terms. Translate them into Russian.

Unit 5. FACTORS TO CONSIDER WHEN BUYING MECHANIC TOOLS

Exercise 1. Many automotive mechanic tools are being sold in the market today. Why do you need good quality mechanic tools, if you could get cheaper alternatives? Well, there are tons of reasons for that! Read about some benefits of using good quality mechanic tools. Match the reasons (1-4) and the explanations (a-d).

Benefits of Using Mechanic Tools

Information source: https://fullgleam.com/mechanic-tools/#what-tools-does-a-mechanic-need

1. Investment	a. Having a wide variety of tools available makes learning and practising easier. You can improve your automotive maintenance skills much faster, if you have access to the appropriate tools. Using the right tools for the job will help you save more time. Proper usage can also keep you safe while you're working.
2. Time-Saving	b. Remember the mantra: the better-quality tools you have, the better the results. It's a good idea to invest in the best tools that you can afford right now since they will be the foundations of the tool kit you will be using, hopefully, for years.
3. Great for Emergencies	c. Automotive mechanic tools can help save you money. That's because when you have your own toolset, you can maintain and repair some of a vehicle needs. For example, changing engine oil, filters, brake pads, and gear oil can be easily done at your garage. Plus, you get to learn new skills and avoid parting with several hundred bucks. Now, talking about the investment, there are other interesting tools for automotive mechanics. One of the best mechanic tools to own is the garage workbench. A garage workbench usually has a large tabletop so you can do all your DIY and repairs work comfortably. Also, it includes storage to store and organize all the tools and materials in it. It's definitely a 'must-have' tool in any garage and a good investment.
4. Better Results	d. One important reason to get your own mechanic's tools is for emergency purposes. It's always a good idea to have a small toolset available in the trunk of your car. With the right tools and accessories, you can repair your car or anybody else's car. For example, you can change tires quicker, tighten anything that comes loose, etc.

Exercise 2. Read and memorize the words and word combinations.

1. grip рукоятка; ручка (инструмента)
2. rubber grip резиновая рукоятка
3. knurled grip рифленая рукоятка
4. etched grip рукоятка с гравировкой травлением
5. novice новичок; начинающий; новоиспечённый; неопытный
6. never-ending list бесконечный список
7. puzzled в недоумении; озадаченный; сбитый с толку; растерянный
8. fastener крепёжная деталь; шуруп; фиксатор; соединительная деталь; застёжка; защёлка; затвор: сцепка; зажим
9. save some money сэкономить; прикопить денег
10. extension bar переходник; удлинительная штанга; наращиватель; удлинитель
11. versatility многофункциональность; гибкость в применении; универсальность; технологичность
12. WD40 (Water Displacement 40) аэрозольный препарат (водоотталкивающее и антикоррозийное средство)

Exercise 3. The best mechanic tools can differ from person to person. Sometimes it's because this is the best you can afford right now. Whatever the best tools are for you, you need to have a few factors in mind when buying the foundations for your collection. Match the factors (1-6) and the explanations (a-f).

Factors to Consider When Buying Mechanic Tools

Information source: https://fullgleam.com/mechanic-tools/#what-tools-does-a-mechanic-need

1. Purpose of Use	a. When starting your tool collection, you have the choice to buy each tool individually or in a set. What's excellent about sets is that you gain access to a collection of type and size of tools that complement each other. But it's also possible that the specific tools you need won't be included. What you should do is create a list of all the necessary tools you need. That way, you can easily see what you still need to buy and what you already have.
2. Tool Storage	b. Another factor when it comes to selecting tools for your garage is the grip. It pays to remember that most of the tools you'll use will come in contact with your hands. You'll be holding them while you work, so grip is crucial. There are many types of grips to choose from: rubber, knurled, etched. Choose what works best with you.
3. Tool Selection	c. A lot of people forget this, but where you intend to keep your tools is also an important factor you need to consider when starting your tool collection. You will need storage space that is big enough to hold all your tools and is durable enough to keep them safe. You might also want to consider how convenient your storage solution is. Will you be keeping the tools in separate toolboxes? Or is a high-quality, aluminium tool chest a better option for you?
4. Grip	d. Like grip, the weight of your tools can also be a crucial factor you want to consider. It can be uncomfortable to work with tools that you find heavy, after all. The same goes with tool sets. If you want a portable tool set, try sticking to a kit that's below 20 lbs.

5. Weight	e. The price of your tools will depend on how much you can afford at the moment. There are lots of options out there to pick from. Not everything expensive is of good quality. So, it really comes down to researching and discovering the products that work well and are still affordable. What you should look more into is the warranty. Mechanic tools are investments in such a way that you will be using them for years to come. It's best to get a warranty that lasts for a more extended period of time (better if you can get a lifetime warranty).
6. Warranty & Price	f. First things first, what project will you usually use your mechanic's tools for? Some people buy a toolset for basic home maintenance and repairs. Others need it for more specific purposes, like fixing up cars. Knowing the purpose of buying your own toolset can help you save money and time. That's because some tool sets might not be suitable for your projects.

Exercise 4. Work in pairs. Read and translate the dialogue between a novice mechanic and an experienced one. Act it out.

Information source: https://fullgleam.com/mechanic-tools/#what-tools-does-a-mechanic-need

A: I want to buy mechanic tools for my DIY projects? There are a lot of tools I need. I've tried to make a list… it's never-ending... I'm puzzled. Which tools are more necessary than others? Can you help me?

B: Yes, sure. Well, there are six most essential tools you will need when starting your tool kit. First, you need hammers.

A: Hammers? Why's that?

B: They're great for banging out some of the stubborn dents or a light knock to separate joints.

A: Okay. And what about pliers?

B: Pliers are a good idea. They're used for gripping and turning wires. They can also be used for fasteners.

A: As to fasteners, I think I need wrenches.

B: You're absolutely right! Wrenches are used for gripping and tightening not only fasteners but also nuts and bolts.

A: So, that's three tools. Anything else?

B: Yes, I would recommend you to buy a universal screwdriver. It's really handy because you'll require different screwdriver ends. And it's not as expensive as a full set of screwdrivers.

A: Great! I can save some money! Shall I buy ratchets and sockets? I have it in my list.

B: Yeah. This type of wrench is a must-have tool. It tightens and loosens nuts and fasteners. And finally, get an extension bar. It allows for more versatility of use with the ratchet. It's done! Your toolkit is ready!

A: Oh, thanks a lot for your help!

B: You're welcome!

Exercise 5. Look through Units 5-9 again. Select a few mechanic tools to start building your own great collection of tools. What tools do you want to have in your toolbox? Explain your choice.

Exercise 6. Read and translate the text. Search the Web for these websites. Which website do you find the most convenient?

Text 1. Where to Buy Mechanic Tools?

Information source: https://fullgleam.com/mechanic-tools/#what-tools-does-a-mechanic-need

Now that you know some of the recommended tools to have, it's time to buy them. What's great about this market is that you can easily buy these tools in a hardware store near you. Even big, retail stores have sections where you can buy these with no problems. But then, you can also buy these conveniently online. Here are some of the best online stores you can visit when buying automotive tools:

– Amazon Business (https://www.amazon.com/mechanic-tools-set). Offers a wide variety of mechanics tools from different brands, excellent warranty and free shipping.

– Tool Source (https://www.toolsource.com/). Offers a wide variety of mechanics tools from mid-range brands mostly.

– Snap-On (https://www.snapon.com/; https://www.snaptool.ru/). Offers a wide variety of mechanics tools. Made in the USA mostly.

– Mac Tools (https://www.mactools.com/). Offers a wide variety of affordable, mid-grade mechanics tools. Made in the USA mostly.

– ASE Deals (https://www.asedeals.com/). Offers heavy-duty equipment for automotive repair and service; for most orders there is free shipping.

Exercise 7. Have a group discussion. Where can you buy good quality mechanic tools in Russia? Search the Web for ideas, if necessary.

Exercise 8. Read and translate the text about maintenance of the mechanic tools. Make a list of steps this process involves. Then, make a summary of the text.

Text 2. How to Clean Mechanic Tools?

Source: https://fullgleam.com/mechanic-tools/#what-tools-does-a-mechanic-need

Since you already know that mechanic tools are investments because you can use them for years to come, it's time to understand how to maintain them.

Proper maintenance is crucial, if you want your tool collection to work well over time. First thing you need to remember is to clean your tools after every use. It means that no oil, grease, and debris should remain. You can use a damp cloth to wipe off the gunk and use a dry cloth to dry them after. You don't want them rusting because of moisture.

Apply some oil like WD40 to the joint to prevent corrosion. Usually, it is put to a place where the rust starts and slowly spread to other parts of the tool.

But that's not all. Make sure to store your tools properly and to clean the storage as well. Dirty storage space can still damage your tools.

Exercise 9. Look through Unit 5 again. Make a list of the words and word combinations you consider to be the terms. Translate them into Russian.

Unit 6. BASIC CAR REPAIRS

Exercise 1. Vocabulary revision. Match the words and word combinations in English (1-20) to their Russian equivalents (a-t).

1. oil	a. сделай сам
2. scratch	b. гаечный ключ, вороток
3. engine	c. масло
4. DIY	d. закручивать, затягивать
5. wrench	e. масляный фильтр
6. loosen	f. царапина
7. tighten	g. поддон для слива масла
8. oil filter wrench	h. опора для домкрата
9. oil drain pan	i. открутить, ослабить
10. jack	j. двигатель
11. jack stand	k. поднимать
12. lift	l. домкрат
13. battery	m. зажимная гайка, колёсная гайка с конусной фаской для центровки
14. polish	n. замена; смена
15. lug nut wrench	o. очистить участок
16. wheel wrench	p. полировать
17. lug nut	q. маслоналивная горловина; масляный фильтр
18. changing	r. аккумулятор
19. clean the area	s. гаечный ключ для снятия и установки колёс
20. oil filter	t. баллонный ключ

Exercise 2. Read and memorize the words and word combinations.

1. basic action основное занятие; основной вид работы
2. car repairs авторемонт; ремонт автомобилей
3. epitomize характеризовать; быть неотъемлемой частью чего-либо
4. changing oil менять масло
5. lifespan продолжительность эксплуатации; долговечность; срок службы; технический ресурс
6. oil drain plug пробка отверстия для спуска смазки; пробка маслоспуска
7. reach дотягиваться; доставать
8. basic steps основные шаги; главные этапы
9. drain the oil спускать масло
10. unscrew свинтить (крышку); отвинчивать; открутить; свинчивать
11. empty освобождать; выливать; опустошать; очистить
12. remove убрать; открыть; снять
13. oil filler hole cap крышка на отверстии маслоналивной горловины
14. pour наливать
15. flat tire/tyre ненакачанная шина; спущенное колесо
16. spare tire запаска
17. lower опускать
18. tight крепко затянутый; закреплённый
19. spark plugs свеча зажигания
20. spark plug wire провод к свече зажигания

21. body shop кузовной цех
22. determine определять, устанавливать
23. depth глубина
24. sanding шлифование песком; пескоструйная очистка; зачистка шлифовальной шкуркой
25. apply применять; использовать
26. rubbing compound
27. wax вощить; натирать восковой полировальной пастой
28. seal the repair замазать/сгладить место, где была удалена царапина
29. roadside assistance техническая помощь на дороге
30. tow truck эвакуатор; буксировщик
31. disconnect the negative cables отсоединять отрицательный кабель
32. battery clamp зажим аккумуляторной батареи
33. battery post полюсный штырь аккумуляторной батареи
34. positive cable clamp положительный зажим кабеля

Exercise 3. Read the international words and guess their meanings.

Auto, mechanics, slang, miles, final, method, label, cable, procedure, regular, neutral, positive, negative, terminal, start, special, battery, cables, cylinder, gasoline, plan, fundamental, technique, filters, legal, connector, system, service.

Exercise 4. Read and translate Part 1 of the text using the wordlist from Exercises 1-3.

Ten Basic Car Repairs Everyone Should Know

Source: https://www.lifehack.org/374885/10-basic-car-repairs-everyone-should-know

Part 1

Most of us have been driving cars since we were in our teens. For many, it's almost impossible to imagine living without a car. In a way, they epitomize a part of our lives. But like many things, cars can fail us. You know the frustration of your car breaking down when you need it the most. Well, what if I told you that some of the most common reasons for car problems have easy fixes you could learn to do yourself? Here are basic car repairs you should know.

1. Changing oil

You need to check regularly and change your car's oil to ensure smooth running of the vehicle and to prolong the lifespan of its engine. Changing your car's oil is one of the most fundamental DIY skills you should have for car maintenance or repair. Of course, it's a different story if the oil filter and oil drain plug of your car are very hard to reach.

Basic steps involve: draining the oil by removing the oil drain plug, unscrewing the oil filter and emptying it, putting the oil filter and drain plug back, removing the oil filler hole cap, and pouring fresh oil. You can learn a lot from the tons of tutorials available online!

2. Changing a flat tire

There's a reason 'wheels' is slang for car. It's because the tires are one of the most important parts of your vehicle. And sometimes they can go flat. But changing a flat tire doesn't have to be a big deal and could actually be a lifesaving skill to learn.

Basic steps involve: loosening the lug nuts (with a wrench), using a jack stand to lift the car off the ground, removing the lug nuts (and subsequently the tire), placing the spare tire on, wrenching the lug nuts back on, lowering the car, and finally making sure the lug nuts are tight. Simple!

3. Changing spark plugs

Most of us know what spark plugs are and what they do. They are the tiny devices inside the cylinder that create sparks to ignite the gasoline, ultimately powering your vehicle. But they do wear out every 10,000 miles or so. The fix is actually quite easy.

The steps include: locating your spark plugs, removing the spark plug wire, removing the faulty spark plug, inserting the new spark plug in its place, and putting the wire back. Well done!

4. Removing scratches from paint

Scratches are the absolute worst. Even the tiniest scratches are visible from a distance and can kill the overall appearance of your metal monster. Unfortunately, it may cost you thousands to get them removed in a body shop. But you can save the money and the frustration with a simple DIY job.

The steps include: determining the depth of the scratch, lightly sanding the scratch, cleaning the area, applying rubbing compound, polishing the area with the rubbing compound, washing the area, and finally waxing the area to seal the repair. That's it. You've just saved yourself a lot of money.

5. Changing a car battery

Car batteries tend to die on us at the most inconvenient times. If you're in the middle of nowhere, your best bet would be to find roadside assistance or call a tow truck. But if you're home and your battery shows signs that it might need replacement, the DIY replacement method is quite easy.

The steps include: removing any covers from the battery, disconnecting the negative cables, moving the clamp away from the battery post, doing the same for the positive cable clamp, removing all screws, replacing the old battery with the new one, and finally reconnecting the cable clamps. Make sure you label the cables before you remove them.

Exercise 5. Answer the questions.

1. What are the first five basic car repairs everyone should know?
2. Why is it necessary to check and change the oil regularly?
3. What are the basic steps of changing the oil?
4. Why is a car called 'wheels' in slang?
5. Is it hard to change a flat tire?
6. What tools do you need to change the flat tire?
7. What steps should be made to change the flat tire?
8. Why do most drivers want to remove scratches on their beloved cars?
9. Is it expensive to get scratches removed in a body shop?
10. Is removing scratches from paint a simple DIY car repair?
11. What does the process of scratch removal involve?
12. When do you need to change a car battery?
13. What are the main steps of the car battery replacement?

Exercise 6. Read and memorize the words and word combinations.

1. screw винт; болт; шуруп
2. headlight фара
3. taillight задний габаритный фонарь
4. frame рама
5. headlight bracket кронштейн фары
6. disconnect отключать; отсоединять; разъединять

7. electrical connector электрический разъём
8. faulty bulb неисправная лампа/лампочка
9. replacing wipers замена дворников/щёток стеклоочистителей
10. windshield wiper arm рычаг стеклоочистителя
11. depress the tab нажать крепежную лапку (фиксатора)
12. wiper blade щётка стеклоочистителя
13. be pulled off вынимать (из держателя)
14. line up надевать (новую щетку на рычаг)
15. hood капот
16. air filter воздухоочиститель; воздушный фильтр
17. air filter cover крышка корпуса воздушного фильтра
18. housing корпус (воздушного фильтра)
19. brake pad тормозная колодка
20. slider bolts фиксирующие болты
21. replica wheels колеса-копии
22. jump-start запускать двигатель от аккумулятора другого автомобиля; «прикуривать»
23. jumper cables электропровода большого сечения (для запуска двигателя от постороннего источника)
24. ignition зажигание
25. red clip зажим красного цвета
26. positive terminal of the battery положительная клемма; положительный вывод аккумулятора
27. unpainted metal surface неокрашенная поверхность металла
28. trouble дефект; неисправность; повреждение
29. car maintenance техническое обслуживание и текущий ремонт машин
30. fault дефект; изъян; выход из строя; неисправность; короткое замыкание
31. engine cleaning промывка двигателя
32. brake fluid тормозная жидкость

Exercise 7. Read and translate Part 2 of the text using the wordlist from Exercise 6.

Ten Basic Car Repairs Everyone Should Know

Source: https://www.lifehack.org/374885/10-basic-car-repairs-everyone-should-know

Part 2

1. Replacing a headlight or taillight

Having a broken headlight or taillight is not only inconvenient, but is actually illegal. Consequently, you need to change them as soon as they begin to fade. But why waste money on a mechanic when the DIY replacement is so easy?

The process involves: removing the screws connecting the headlight frame to the bracket, disconnecting the electrical connector, removing the faulty bulb and replacing it with a new one, plugging the connector back on, and finally replacing the frame. Sometimes only your frame might be broken, which can be just as hazardous. You can change it following the same procedure.

2. Replacing wipers

Windshield wipers are one of the least-appreciated parts of your car's safety system. Imagine what would happen if they failed on you during a heavy rain or snowfall, perhaps resulting in damage to your brand-new vehicle. Faulty wiper blades need to replaced, and

you need to be sure that your windshield wipers are always in perfect shape. This DIY is an easy fix.

The steps involve: lifting the wiper arm away from the windshield, depressing the small tab that allows the wiper blade to be pulled off, lining up the new wiper blade with the arm, and pushing it in tightly. Done!

3. Replacing air filters

Air filters are one of the most overlooked parts of your car. They keep your engine free of dust and other contaminants. They are inexpensive and quite easy to replace, so keeping your car's engine clean is another easy DIY.

The steps include: opening the hood, locating the air filter unit, removing the air filter cover, taking the air filter out and cleaning the air filter housing, inserting a new filter, and finally replacing the cover. You've done it! Make sure you change your filter once every 30,000 miles or approximately once every year.

4. Changing brake pads

The brakes are one of the most important elements of your vehicle for ensuring your safety while driving. Many car accidents result from brake failures, so your car's brakes always need to be in perfect condition. Thankfully, changing the brake pads can be as easy as changing a flat tire.

Basic steps involve: loosening the lug nuts of the wheels, jacking the car up, removing the wheels, removing the slider bolts, removing the older brake pads and replacing them with new ones, and putting the slider bolts and the wheels back on securely. You should be particularly careful if you're using replica wheels. This is another simple DIY that can save you some money!

5. Jump-starting a car

This is not a repair. It is a fundamental skill. Everyone should know how to jumpstart their own car. You wouldn't want to have to call roadside assistance every time your car won't start, and it's really the easiest thing ever.

Just take your jumper cables out, put both vehicles in neutral and shut the ignition off. Now, attach one of the red clips to the positive terminal of your battery and the other to the positive terminal of the battery in the other car (the one that *will* start). Attach one of the black clips to the negative terminal of the battery in the other car. Attach the other end to an unpainted metal surface. Now try to start your vehicle.

Exercise 8. Answer the questions.

1. What are the rest five basic car repairs everyone should know?
2. Why must drivers replace a broken headlight or taillight?
3. What is the procedure of replacing headlights or taillights?
4. Why are wipers regarded as the parts of the car's safety system?
5. Is it hard to replace wipers?
6. What steps should be made to replace wipers?
7. What is the role of an air filter?
8. How often do you need to change the air filter?
9. What are the main steps of replacing air filters?
10. Why do your car's brakes need to be in perfect condition?
11. What does the process of changing brake pads involve?
12. Why is a car jump-starting regarded as a fundamental skill?
13. What do you need to jump-start a car?
14. What should you do to jump-start your car?

Exercise 9. Match the common automotive mechanic basic skills for car maintenance (1-10) to their descriptions (a-j).

Information source: https://toolsarcade.com/automotive-mechanic-basics/

1. Engine cleaning	a. This trouble happens quite often and it may happen anywhere. This skill involves lug nuts removing with an impact driver or a rachet wrench and using a jack stand to lift the car off the ground and placing the spare tire on.
2. Changing oil	b. This is also a common task for the automobile. Spark plugs are the small parts inside the cylinder that create sparks to ignite the gasoline and power your car. So, if you have a mechanic toolset, you can easily remove the old and infected plugs and fit the new ones.
3. Changing a flat tire	c. Windshield wipers are an essential part of a car's safety system when driving in heavy rain or snowfall. Defective wiper blades may cause car crashes, so just learn how to replace them. By applying simple technic, you can replace wipers in any situation.
4. Battery change	d. This is a common task for auto mechanics and a regular maintenance task for the car users. The engine is a sensitive area of vehicles, so it needs special care during the cleaning. It should be cleaned regularly.
5. Spark plugs changing	e. It's very frustrating when your infected batteries will end up and destroy your plans. So, this is a fundamental skill for drivers. It's such an easy technique that you can apply it whenever and wherever you are.
6. Replacing the wipers	f. This trouble is dangerous and illegal. Also, sometimes it may happen during a night drive. So, what is the solution? Just unscrew the light frame and cover, then disconnect the power connector and remove the faulty bulb. After that insert the new bulb and set the light frame.
7. Jumpstarting a car	g. The brake system is a matter of security. It must be checked and serviced regularly. It's not hard. Enough brake fluid makes sure that the brake system will work properly.
8. Replacing the air filters	h. You need to check and change your car's oil regularly. It will ensure the smooth running of the automobile and prolong the lifespan of its engine.
9. Replacing the headlights	i. No doubt air filters are very useful parts to keep your car engine dust-free. So, you have to check their condition and replace them when you got a fault. Just remove the air filter and insert a new filter. It is very simple.
10. Checking the brake fluid	j. This is considered an easy car skill that everybody can learn because most car battery failures happen at inconvenient moments. Just disconnect the cables and clamp from the battery, unscrew the nut, remove the old battery and set a new one.

Exercise 10. Match the verbs (1-3) to the nouns they can go with (a-c).

1. to change	a. scratches from paint
2. to replace	b. oil, a flat tire, brake pads, a car battery, spark plugs
3. to remove	c. a headlight, a taillight, air filters, wipers

Exercise 11. Read and translate the dialogue between a car mechanic and a customer. Act it out with a partner.

Mechanic: The air filter needs to be replaced. It's simple. I can show you how to do it.

Customer: Oh, that would be great!

M.: First, open the hood and locate the air filter unit.

C.: Okay. What's next?

M.: Now remove the air filter cover, take the air filter out and clean the air filter housing.

C.: I see. And what shall I do after that?

M.: Then insert a new filter and finally replace the cover. You've done it!

C.: That looks easy enough!

M.: Yeah, it's not too difficult! And I recommend you to do it at least once a year.

C.: Thanks a lot!

M.: You're welcome!

Exercise 12. Work in pairs, one of you is a mechanic and the other is a client. Make a similar dialogue about car repairs based on ideas from the texts in this unit. Act it out.

Exercise 13. Look through Unit 6 again. Make a list of the words and word combinations you consider to be the terms. Translate them into Russian.

Unit 7. CHANGING A WHEEL AND THE WIPER BLADES

Exercise 1. Vocabulary revision. Look at the list of automotive mechanic basic actions (A) and a list of auto mechanics jobs (B). What actions can each of the mechanics do?

A	B
1. Changing oil.	
2. Changing a flat tire.	
3. Changing spark plugs.	a. Service Technicians
4. Removing scratches from paint.	b. Diagnostic Technicians
5. Changing a car battery.	c. Body Repair Technicians
6. Replacing a headlight or taillight.	d. Vehicle Refinishers
7. Replacing wipers.	
8. Replacing air filters.	
9. Changing brake pads.	
10. Jumpstarting a car.	

Exercise 2. Match the words and word combinations (1-9) to their opposites (a-i).

1. connect	a. tighten
2. positive	b. inflated tire
3. loosen	c. hard
4. old	d. expensive
5. flat tire	e. minus
6. simple	f. disconnect
7. cheap	g. stop
8. plus	h. negative
9. start	i. unpainted
10. painted	j. new

Exercise 3. Read and memorize the words and word combinations.

1. breakdown assistance техническая поддержка в случае аварии или поломки
2. boot багажник
3. locking wheel стопорное колесо
4. nut key гаечный ключ
5. glove box ящик для мелких вещей, бардачок (в автомобиле)
6. high-vis jacket светоотражающий жилет
7. warning triangle знак аварийной остановки (треугольный отражатель)
8. anti-clockwise против часовой стрелки
9. owner's manual руководство пользователя; инструкция для владельца
10. inflated tyre накачанная шина
11. spare tyre запасное колесо
12. all-season tires всесезонная шина
13. handling перемещение
14. highway шоссе, магистраль
15. tyre traction сила сцепления колёс с дорогой
16. symmetrical trend patterns симметричный протекторный рисунок
17. groove канавка в протекторе шины
18. wet grip сцепление шин с влажной поверхностью дороги
19. summer tire летняя резина; летняя шина
20. contact patch поле зацепления
21. circumference окружность
22. hydroplaning аквапланирование (попадание слоя воды в зону контакта шины с дорогой при движении с высокой скоростью по мокрой дороге)
23. rip рваться
24. winter tire зимняя шина/резина
25. sipes щелевидные дренажные канавки (протектора шины)
26. eject выталкивать
27. slush грязь, слякоть; жижа; снеговая каша; шуга
28. studded tire шипованная шина; шина с шипами противоскольжения
29. stud гвоздь с большой шляпкой
30. pin шип

Exercise 4. Read and translate a detailed description of changing a wheel.

Text 1. Changing a Wheel

Source: https://www.tempcover.com/front-cover/driving-advice/4-basic-car-repairs-anyone-can-master

A flat tyre can be a real pain, especially if you only discover it when you're out and about. What can be an even bigger pain is to have it changed. You'll either have to sit and wait for some breakdown assistance or risk driving on it to take it to a garage. Of course, like most car repairs, changing a tyre is actually pretty simple and straightforward, if you have the right tools and a bit of knowledge how to do it. For changing a tyre you'll specifically need a spare wheel, which you should find in your boot, a jack to lift the car, a wheel wrench and the locking wheel nut key which you can usually find in the glove box. If you are changing a tyre on the side of the road, you should probably have some sort of high-vis jacket and a warning triangle.

Once you've got all your tools, the first thing you want to do is loosen the wheel bolts with the wheel wrench, turning anti-clockwise. Be sure to use a bit of force when first loosening the bolts. One of the bolts may need the locking wheel nut key to unlock it.

After you've loosened the bolts, you need to jack up the car. You can find the jacking point in the owner's manual. When the jack is in place, a few clockwise cranks should be enough to get the tyre up. As soon as there is light between the ground and the wheel, you have enough room to change the tyre.

Next, you need to remove the loosened bolts – remember to keep these bolts in a safe place and take off the tyre.

With the new, inflated tyre, line-up the holes for the bolts and hold the wheel in place. Screw one of the wheel bolts in to make sure it's all positioned correctly and then, by hand, insert the rest of the bolts.

Using the wheel wrench, tighten all the bolts before slowly lowering the jack until the wheel is back on the ground. When it's on the ground, tighten the bolts again so they are as tight as you can make them.

Remember that spare tyres are not meant to be driven on long term so when you get home, be sure to arrange to have a new tyre fitted as soon as possible.

Exercise 5. Look through Text 1 again. Make a list of tools you need to change a wheel and a list of basic steps this action involves.

Exercise 6. Read and translate Text 2 about types of tires. Which types of tires do you use in Siberia? When do you usually change your tires?

Text 2. Most Common Types of Tires

Source: https://www.theengineerspost.com/types-of-tires/

All-season tires are manufactured to give comfort and handling on the highway, as well as safe all-season traction. They typically have symmetrical trend patterns and surface grooves to hold a wet grip.

Summer tires are also designed for performance in wet and dry situations. They are not manufactured for all-season traction. They are adapted for hot climate and provide grip and sensitive handling in wet or dry conditions. The temperature range for safe summer tires is above 45° Fahrenheit. The summer tires typically have solid contact patches, grooves with sufficient circumference for hydroplaning resistance, and no ripping. They are used during warm periods or all year in areas that are not found in a true winter.

Winter tires are manufactured for the possible traction in severe winter situations of less than 45 degrees. Winter tires come in a type of uses and are produced for a wide variety of vehicles. They have heavy sipes and deep perimeter grooves that act to eject snow and slush buildup from contact patches. Studded and non-studded are the two types of winter tires. Studded winter tires have tiny metal studs or pins that are designed to deliver the peak of traction in icy driving surfaces. Non-studded tires are made for excellent traction in winter requirements, and, likewise, give a decent grip on snow.

Exercise 7. Read and memorize the words and word combinations.

1. overlooked невыявленный, нераспознанный
2. streaks полосы; следы
3. splits полосы; участки плохо протертого стекла
4. squeaking noises резкие/скрипучие звуки
5. windscreen переднее стекло, ветровое стекло
6. wiper blade щётка стеклоочистителя
7. size размер, величина; габариты, объём
8. tape measure рулетка, мерная лента; сантиметр (портновский)

9. reg. number (registration number) регистрационный номер
10. arm рычаг
11. locking tab крепёжная лапка
12. locking button кнопка с фиксацией; фиксатор
13. slide двигаться плавно, без резких скачков

Exercise 8. Read and translate a detailed description of changing the wiper blades.

Text 3. Changing Your Wiper Blades

Source: https://www.tempcover.com/front-cover/driving-advice/4-basic-car-repairs-anyone-can-master

An often-overlooked car repair that many drivers avoid is changing your wiper blades. If your wiper blades are causing streaks, splits or squeaking noises, you will need to change your wipers, otherwise, you risk damaging your windscreen.

It's incredibly simple to change your blades, so it's time to stop avoiding the job and master it, plus the whole job takes just a couple of minutes.

First, you'll need to know the size of your wiper blades. You'll just need to know the length of your wiper blade which you can easily find out using a tape measure. If you're not exactly sure what you're looking for, shop assistants can help you find the right blade size by simply entering your reg. number.

Once you've got the new blades, you'll need to remove the old ones. Lift the wiper arm off the windscreen and pop open the locking tab or press the locking button – then simply slide the old wiper blade out.

Be careful to gently place the wiper arm back on the windscreen or this metal arm could seriously damage your screen.

Now all you have to do is take the new wiper blades and gently slide them into the wiper arm making sure to hold the arm steady at all times. The locking button should click back into place automatically when the new blade is in position. Ensure the new blade sits comfortably on the windscreen, give it a quick test and that's it, you're all set.

Exercise 9. Look through Text 3 again. Make a list of tools you need to change the wiper blades and a list of basic steps this action involves.

Exercise 10. Read and translate the dialogue between a driver and a passenger. Act it out with a partner.

Driver: I can't believe we got a flat tyre.

Passenger: Don't worry. It's not difficult to replace it. I'll help you.

D.: Great. How do we start?

P.: Well, first let's put on high-vis jackets, gloves and put a warning triangle behind the car.

D.: Okay. What's next?

P.: Let's check if we have everything we need. Have you got a spare tire?

D.: Yes, sure. And I've got a jack in my trunk. Do we need anything else?

P.: Yes, a wheel wrench to loosen the bolts and we may need a wheel nut key as well.

D.: Those are in the trunk, too.

P.: Fine! Let's start then.

Exercise 11. Work in pairs. Make similar dialogues about other car troubles. Act them out.

Exercise 12. Look through Unit 7 again. Make a list of the words and word combinations you consider to be the terms. Translate them into Russian.

Unit 8. JUMP-STARTING A CAR AND REPLACING A DEAD BATTERY

Exercise 1. Read and translate a detailed description of jump-starting a car. Put the paragraphs (A-F) in the correct order.

Text 1. Jump-starting a Car

Information source: https://www.tempcover.com/front-cover/driving-advice/4-basic-car-repairs-anyone-can-master

A

Another car issue that can be incredibly frustrating is a dead battery. We've all been there, continually turning the key over and over again, hoping and praying that the engine will start. If that doesn't work, you'll need to jump-start your car using another vehicle.

B

Once all the clips are in place, one on your battery, two on the other car's battery and one on the metal surface, you can start your engine and leave it running for a few minutes.

C

If your car still won't start, check the cables are correctly positioned; otherwise, you could have a dead battery on your hands. Don't panic though; changing a battery is nothing to worry about.

D

Jumpstarting a car is very simple and straightforward. First, you'll need jumper leads. These are car maintenance essential and could really save the day in an emergency.

E

Then you need to take one of the black clips and attach it to the smaller, negative terminal on the other battery. The final unused black clip should then be connected to an unpainted metal surface on your car that isn't near the battery.

F

Second, take your jumper cables and ensure that both vehicles are parked in neutral with the engines off. Take one of the red clips and attach it to the positive (displayed as POS or +) terminal on your battery and the other red clip to the positive terminal of the car that will start.

Exercise 2. Make a summary of Text 1.

Exercise 3. Read and memorize the words and word combinations.

1. tarpaulin непромокаемый брезент
2. plastic casing пластиковый корпус
3. spanners гаечные ключи
4. terminal клемма
5. leaking acid подтекание/утечка кислоты
6. dried out sulfuric acid подсохшая серная кислота
7. touch касаться; трогать

8. bare hands голыми руками
9. reattach восстанавливать соединение, повторно присоединять
10. reconnect снова подключать
11. dispose утилизировать
12. chuck бросать; кидать; швырять
13. recycling centre центр вторичной переработки отходов
14. car manuals инструкции и руководства по обслуживанию автомобилей

Exercise 4. Read and translate a detailed description of replacing a dead battery.

Text 2. Replacing a Dead Battery

Source: https://www.tempcover.com/front-cover/driving-advice/4-basic-car-repairs-anyone-can-master

First things first, ensure the vehicle is turned off and in neutral. You might want to lay some old sheets or tarpaulin down to protect your car.

Now, carefully remove any plastic casing around the battery and remove the cable on the negative terminal first using one of your smaller spanners. The terminals will be identified by a NEG or '–' sign.

Then do the same with the positive terminal cable (displayed as POS or +). Take both cables off and set them to one side.

Before removing the battery, and generally throughout the whole process, look out for any leaking acid or dried out sulfuric acid. If you do spot any, do not touch it with bare hands and if there is a large leak, leave the battery change to a trained professional.

You can now remove the battery, removing any extra screws or bolts as you go. Place the old battery safely to the side and pick up the new one. Ensure that the new battery is placed facing the same way as the broken battery.

Make sure you reattach any bolts that were securing the battery and then reconnect the positive terminal ensuring it's as tight as before. Do the same for the negative terminal now and you're all set.

You must dispose of the old battery properly; you can't just chuck it in the bin. A quick google search for a battery recycling centre will give you all the answers you need.

Exercise 5. Look through Text 2 again. Make a list of tools you need to replace a dead battery.

Exercise 6. Look through Text 2 again. Make a list of basic steps this action involves.

Exercise 7. Look at the list of automotive mechanic basic actions (A) and a set of essential car repair tools (B). What tools (a-i) from the set (B) do you need to tackle each of car repairs (1-10)? Choose a few tools for one action.

A	B
1. Changing oil. 2. Changing a flat tire. 3. Changing spark plugs. 4. Removing scratches from paint. 5. Changing a car battery. 6. Replacing a headlight or taillight. 7. Replacing wipers.	a. A set of screwdrivers (Get a mix of sizes and heads including Phillips head) b. A set of spanners (Get a range of sizes from 8mm to 17mm) c. A socket set d. A pair of pliers e. A tyre pressure gauge

8. Replacing air filters. 9. Changing brake pads. 10. Jumpstarting a car.	f. A can of WD40 g. A torch h. A duct tape i. An allen key

Exercise 8. What tools would you add to the set in column B in Exercise 7 to be able to solve all the troubles in column A?

Exercise 9. Look through Units 10-12. Choose one of the car repairing actions and write its detailed description.

Exercise 10. Read and translate Text 3. Match Parts 1-7 of the text to their titles (a-g).

Part 1	a. DIY Car Maintenance Courses
Part 2	b. Car Manufactures' Websites
Part 3	c. Car Blogs
Part 4	d. Car Manuals
Part 5	e. Automotive Journals
Part 6	f. Auto Mechanic Books
Part 7	g. Video Lessons

Text 3. How to Learn Automotive Mechanics Basics?

Information sources: https://toolsarcade.com/automotive-mechanic-basics/, https://www.defensivedriving.org/dmv-handbook/best-car-blogs/, https://carbonfibergear.com/pages/55-best-car-blogs-for-auto-enthusiasts

If you want to be a professional automotive mechanic, you should go to a college or university to get a job-related education. In addition, you can also use some extra sources to get and improve your knowledge by self-studying.

Part 1

If you want to learn automotive mechanics basics, one option is to buy some auto mechanics books. They usually have detailed descriptions of troubleshooting and even can be illustrated. Books are good option because you can make your own collection of them; keep them at hand and read them in a calm atmosphere.

Part 2

One more effective way of learning basic auto mechanics is by taking a short course. Many famous companies and universities provide DIY car maintenance courses. They offer a big choice of different courses. Moreover, you can do an online course for your convenience.

Part 3

For some people it's very important to see how to perform the actions. In this case you can watch video tutorials. Many expert auto mechanics provide from basic to advanced lessons through automobile video tutorials. Furthermore, you can visit some YouTube channels to learn visually, join some blogs, etc.

Part 4

Another reliable source of basic automotive maintenance data is automotive journals. You can follow and subscribe to automotive journals to learn basic auto mechanics.

Part 5

All new cars come with an owner's manual from the manufacturer. Most owners leave them in the glove compartment for easy reference. Owner's manuals usually cover

three main areas – a description of the location and operation of all controls, a schedule and descriptions of maintenance required, both by the owner and by a mechanic, and specifications such as oil and fuel capacity and part numbers of light bulbs used.

Part 6

Manufactures websites are also a good source of information about various models of a definite brand. They offer company news, car reviews, press releases, images, videos, and stories focusing on current and forthcoming automobiles of their brand in particular and on the auto industry in general.

Part 7

Some of the best places to learn about cars online are on some of the leading car blogs. You can read about car safety, check out classic cars, see the best-rated models, and even learn a thing or two about car maintenance and repair. They offer daily podcasts, advice and test drives of different cars, car reviews for those wanting to shop for vehicles online, articles on cars' features and automotive accessories, the latest updates on cars, racing, etc.

Exercise 11. Have a group discussion. What sources of information do you use to find out about car repairs and maintenance? Explain your choice.

Exercise 12. Look through Unit 8 again. Make a list of the words and word combinations you consider to be the terms. Translate them into Russian.

Unit 9. MAIN AND WEIRD MATERIALS USED IN AUTO MANUFACTURING

Exercise 1. Match the materials 1-10 to their Russian equivalents (a-j).

1. iron/cast iron	a. нефтепродукт
2. plastics	b. резина; каучук; резиновый
3. fiberglass	c. алюминий
4. petroleum product	d. сталь; стальной
5. copper	e. железо; чугун
6. stainless steel	f. стекло; стеклянный
7. glass	g. стекловолокно
8. aluminium	h. медь; медный
9. steel	i. пластмасса, пластик
10. rubber	j. нержавеющая сталь

Exercise 2. Read and memorize the words and word combinations.

1. auto manufacturing производство автомобилей
2. HVAC (heating, ventilation and conditioning) system система отопления, вентиляции и кондиционирования воздуха
3. raw materials сырье
4. dashboard приборная доска; панель приборов; приборная панель
5. needle стрелка
6. wiring прокладка электрических проводов; электропроводка
7. transmission gears коробка передач, коробка скоростей
8. SUV (Sport Utility Vehicle) внедорожник (полноприводный автомобиль повышенной проходимости, обычно предназначенный для активного отдыха)

9. chassis ходовая часть; шасси; рама
10. door beam дверная балка
11. exhaust выхлоп; отработавшие газы; выхлопная (выпускная) труба
12. gauge/gage манометр; измерительный прибор
13. dial круговая шкала; циферблат
14. switch выключатель; переключатель
15. vent отверстие для обдува
16. door handle дверная ручка
17. floor mat коврик на полу салона автомобиля
18. seat/safety belt ремень безопасности
19. air bag воздушная подушка безопасности
20. oil dipstick масляный щуп
21. lightweight лёгкий; облегчённый
22. engine block блок цилиндров
23. boost повышение; усиление
24. fuel mileage пробег в милях на галлон израсходованного топлива
25. road safety безопасность движения
26. engine mount опора двигателя; подвеска двигателя
27. seal уплотнение
28. hose шланг
29. belt лента; ремень
30. durable долговечный; стойкий; надёжный, прочный
31. rear mirror зеркало заднего вида
32. side-view mirrors боковое зеркало заднего вида
33. insulation material изоляционный материал
34. screen козырёк; щит; экран; заслонка; жалюзи
35. lens рассеиватель; прозрачный колпак для фары или фонаря
36. back-up cameras камера заднего вида
37. laminated glass многослойное стекло, слоистое стекло; безосколочное стекло; триплекс
38. shutter задвижка; заслонка; затвор
39. malleable ковкий; податливый; удобный в обработке
40. versatility многофункциональность; эксплуатационная гибкость; универсальность
41. wheel rim обод колеса
42. outer panel панель наружной обшивки (кузова)

Exercise 3. Read the international words and guess their meanings.

Plastic, material, transmission, aluminium, manufacturing, technologies, innovative, industry, structure, component, percent, panel, traditional, block, construction, navigation, lamination, vinyl.

Exercise 4. Read and translate the text using the wordlist from Exercises 1-3.

Text 1. Top 5 Materials Used in Auto Manufacturing

Source: *https://auto.howstuffworks.com/under-the-hood/auto-manufacturing/5-materials-used-in-auto-manufacturing.htm*

Have you ever wondered exactly what your car is made of? No, not how hard and fast it can be pushed on a race track, or what its limits off-road really are, but what materials are actually used to build it. We hear a lot about the parts that make up our cars, such

as engines, transmissions, seats, HVAC systems, and so on. But we never really give much thought to the bits and pieces of raw materials that are used in auto manufacturing to create these things.

The car industry uses a tremendous number of materials to build cars, including iron, aluminum, plastic, glass, rubber, petroleum products, copper, steel and others. These parts are used to create everything from those small things we don't think about, such as dashboard needles and wiring, to the big stuff, such as the engine block or the transmission gears. These materials have evolved greatly over the decades, becoming more sophisticated, better built, and safer. They've changed as new automotive manufacturing technologies have emerged over the years, and they're used in increasingly innovative ways.

In this article, we'll discuss five of the materials used most in automotive manufacturing. Up first, we'll take a look at the one that makes automobiles so heavy.

1. On modern cars, most of the weight comes from ***steel***. In 2007, for example, the average car contained 2,400 pounds (1,090 kilograms) of steel, and the average pickup truck or SUV used nearly 3,000 pounds (1,360 kilograms). Consider that most cars now weigh around 3,000 pounds, and most SUVs weigh around 4,000 pounds (1,810 kilograms). That's a lot of steel!

In cars, steel is used to create the underlying chassis or cage beneath the body that forms the skeleton of the vehicle and protects you in the event of a crash. Door beams, roofs and even body panels created during auto manufacturing are made of steel on most cars today. Steel is also used in a variety of areas throughout the body to accommodate the engine or other parts. Exhausts are often made from stainless steel, for example. Steel manufacturing has evolved greatly, so carmakers these days can make different types of steel for different areas of the vehicle that are rigid or that can crumple to absorb different impacts. These innovations in automotive manufacturing help keep you safe on the road.

2. The next time you're sitting inside your car, do like Dustin Hoffman's character did in 'The Graduate' and think of one word: ***Plastics.*** Tremendous amounts of plastics are used in auto manufacturing nowadays. They make up about 50 percent of the construction of new cars today. It's not surprising because plastics are durable, cheap to make and can be turned into just about anything.

Your dashboard, gauges, dials, switches, air conditioner vents, door handles, floor mats, seat belts, airbags and many other parts are all made from different types of plastics. In addition to the dashboard parts, many of the tiny parts inside the engine, such as the handle on the oil dipstick, are also made of plastic. Because of their lightweight nature, plastics are being increasingly used in body structures and in engines during automotive manufacturing.

3. ***Aluminium*** is being used increasingly in the car world for its lightweight but tough nature. In 2009, aluminium components made up about 9 percent of the weight in most modern vehicles, compared with about 5 percent in 1990 and just 2 percent in 1970.

Aluminium can be used in automotive manufacturing to create body panels for a lighter, more performance-oriented vehicle. Starting with the Acura NSX in the early 1990s, many supercars have been constructed out of aluminium, including the white-hot Audi R8. Wheels are also often made out of aluminium. In addition, more automakers are switching from traditional iron blocks for engines to aluminium construction. It tends to be not quite as durable as iron, but its lighter weight means a big boost in performance.

4. What's the one thing all automobiles have in common? They all need tires if they're going to get around. Tires are one of those parts people tend to take for granted, but they're one of the most vital parts of any vehicle. This is where the importance of ***rubber*** comes into play in auto manufacturing.

Automotive manufacturing is the driving force of the rubber industry, as about 75 percent of the world's natural rubber production is used to make tires for vehicles. The rubber tire protects the rest of the wheel and its internal parts from wearing down, which can be good for fuel mileage and road safety. In addition to the all-important tires, parts such as wiper blades, engine mounts, seals, hoses and belts are also made from rubber. As with plastic, it's a very durable, cheap and flexible material that has a wide array of uses in automobiles.

5. What good is a car if you can't see out of it? As with rubber, ***glass*** is one of the unsung heroes of automotive manufacturing. It's also heavily linked to the auto industry – when business drops greatly for automakers, glass manufacturers also experience job losses.

Glass is used in many areas of your car. Obviously, its primary use is to create windshields so you can see properly while remaining safe from any airborne objects. The windshields are made of laminated glass. Glass lamination assures users of the highest safety levels, especially in the event of a crash. Lamination involves putting a thin layer of vinyl between two glasses. This ensures that there is not shutter when the glass is crushed. Glass is also used to create rear and side-view mirrors to boost your view of what's around you while driving. In addition, its cousin fibreglass is also commonly used in auto manufacturing as an insulation material on cars. However, as technology advances, glass is also being used to create more innovative parts on cars. For example, it can be used to create navigation screens and lenses for back-up cameras to allow drivers to have an even better view of what's behind them.

Exercise 5. Match the parts and components of cars (a-e) to the materials they are made of (1-5).

1. Steel	a. The wheels, most engine blocks.
2. Plastic	b. Engine mounts, hoses, seals, wiper blades, and belts.
3. Aluminium	c. Door panels, the chassis, the support beams, exhaust pipes, mufflers, and the frame of the car.
4. Rubber	d. Navigation screens, back-up camera lenses, and mirrors.
5. Glass	e. The dashboard, door handles, pipes, and air vents.

Exercise 6. Match the materials (1-5) to their characteristics (a-e).

1. Steel	a. The light-weight, durability, malleable, not quite as durable as iron, it is lighter, able to replace steel
2. Plastic	b. Cheap, durable, and flexible; it handles heat well
3. Aluminium	c. Transparent, can be laminated
4. Rubber	d. Cheap, malleable and still strong enough to hold the structure in shape; durability, versatility, and lightweight
5. Glass	e. Strong

Exercise 7. Match the questions (1-9) to their answers (a-i). Make similar questions about other parts of a car. Work in pairs. Ask and answer your questions.

Information source: *https://xn--80agabe1dc1k.xn--p1ai/wp-content/uploads/2021/02/English-for-Car-mechanics-2021.pdf*

1. What is the body made of?	a. The windscreen wiper is made of plastic.
2. What are the wheels made of?	b. The headlight is made of glass and plastic.
3. What is the windscreen wiper made	c. The body is made of metal and aluminium.

of?	
4. What is the windscreen made of?	d. The steering wheel is made of wood, leather, metal.
5. What is the headlight made of?	e. The windscreen is made of glass.
6. What is the steering wheel made of?	f. The number plate is made of metal.
7. What is the bonnet made of?	g. The wheels are made of rubber and metal.
8. What is the tire made of?	h. The tire is made of rubber.
9. What is the number plate made of?	i. The bonnet is made of metal and aluminium.

Exercise 8. Complete the sentences about materials and their properties with the words given in the box.

Information source: *https://xn--80agabe1dc1k.xn--p1ai/wp-content/uploads/2021/02/English-for-Car-mechanics-2021.pdf*

Shatterproof, light, corrosion-resistant, durable, elastic, natural, rigid, malleable

1. Rubber should be able to withstand great temperature differences while staying … . In other words, it shouldn't become brittle. 2. Wood is very often used in interiors because it looks … and warm. 3. Aluminium and magnesium are important in car manufacturing because they are … and therefore good for weight-saving. 4. Windscreens are made of special … glass to protect drivers in accidents. 5. Fabrics used in cars need to be … and not look old too quickly. 6. Steel is used for load-bearing parts because it is … . 7. Sheet metal is used for large car parts because it is … and dent-resistant. 8. Aluminium is ideal for bumpers and other body parts because it is … .

Exercise 9. Read and translate the dialogue between an intern and a car mechanic. Act it out with a partner.

Information source: *https://auto.howstuffworks.com/under-the-hood/auto-manufacturing/5-materials-used-in-auto-manufacturing.htm*

Intern: What are car bodies made of?

Mechanic: Steel and aluminium are two of the most commonly used materials in the manufacturing of cars. Both are strong metals. And lightweight aluminium is ideal for the wheel rims.

I.: No kidding? Are cars still made of steel?

M.: Yes, they are. Many car manufacturers still use steel to build the *frames of cars and trucks* because of the material's natural strength and durability. However, there are different types of steel that are used in the manufacturing process.

I.: Why are cars not made of stainless steel?

M.: Well, stainless steel is more difficult to weld and work with compared to other materials. It's also very expensive.

I.: I've heard that cars can be made of fibreglass.

M.: Yeah, that's right. More and more car manufacturers are now using fiberglass in the design of their cars. It's mainly used to construct the body of the car because it's lightweight and sturdy. Of course, plastic is used for car bodies, too.

I.: I see. And what about the outer panels?

M.: They're normally made of a combination of fiberglass and plastic.

Exercise 10. Match the materials 1-9 from Text 2 to their Russian equivalents (a-i).

1. lead	a. золото
2. titanium	b. родий
3. fiberglass	c. свинец
4. magnesium	d. титан
5. copper	e. углеродное волокно
6. carbon fibre	f. серебро; серебряный
7. gold	g. стеклопластик; фибергласс
8. silver	h. медь; медный
9. rhodium	i. магний

Exercise 11. Read and memorize the words and word combinations from Text 2.

1. fuel consumption расход топлива
2. safety features характеристики безопасности; характеристики защитных устройств
3. durability долговечность; срок эксплуатации, продолжительность срока службы; износоустойчивость; ресурс прочности
4. speed скорость
5. aesthetics эстетика
6. quality качество; свойство
7. scrap металлолом
8. strand волокна
9. woven соединённый, сплетённый
10. resin смола; канифоль; камедь
11. non-corrosive нержавеющий
12. fireproof несгораемый; огнестойкий; тугоплавкий
13. uninjured неповреждённый, непострадавший
14. roof крыша
15. casing обшивка; картер; рама
16. safe безопасный; не связанный с риском
17. heat up нагреваться; разогреваться
18. charging зарядный
19. refrain from воздерживаться от чего-л.
20. density плотность, удельная масса
21. high-end высококачественный; удовлетворяющий самым высоким требованиям; высшего класса; высокопроизводительный
22. exhaust system система выпуска отработавших газов
23. body корпус; кузов
24. structure конструкция; структура
25. throw off the balance нарушать баланс
26. ostentatious показной; нарочитый; хвастливый
27. properties свойства
28. electrical conductor проводник
29. minute quantities ничтожно малое количество, незначительное количество
30. connector соединитель
31. switch contact переключающий контакт; коммутирующий контакт
32. relay contact контакт реле
33. soldering (низкотемпературная) пайка

34. joint соединение; стык; шов; шарнир

35. carbon углерод

36. carbon fibre углеродное волокно, графитовое волокно

37. F1 cars' chassis ходовая часть автомобилей для гонок «Формулы 1»

38. brake disk тормозной диск

39. high-performance с хорошими эксплуатационными характеристиками; высокоэффективный; высококачественный

40. humble простой, скромный

41. carbon black углеродная сажа, технический углерод

42. heat damage повреждение от нагревания, повреждение высокими температурами

43. heating element нагревательный прибор, радиатор отопления

44. rear windscreen заднее стекло

45. front windscreen переднее стекло

46. badge эмблема

47. three-way catalytic converter трёхкомпонентный каталитический нейтрализатор отработавших газов двигателя внутреннего сгорания

48. carbon emission углеродосодержащие выбросы, выбросы углекислого газа

Exercise 12. Read the international words and guess their meanings.

Efficient, material, provide, planning, design, types, exotic, metal, bumper, balance, automobile, aluminium, battery, electronic, system, radio, starter, titanium, company, manufacture, process, method, metallic, traditionally, aesthetically, structure, panel, terminal, critical, processor, component, prestigious, elite, blend, ceramic, disk, gram, model, manufacturer, alternative, element, platinum.

Exercise 13. Read and translate Text 2.

Text 2. What Exotic Materials Are Cars Made of?

Information sources: *https://maycointernational.com/blog/what-are-cars-made-of/, https://www.team-bhp.com/news/different-materials-used-making-our-cars, https://mycarneedsa.com/blog/what-weird-materials-make-cars-so-expensive*

Do you know that having a car made from the most efficient materials will help in fuel consumption while still provide the necessary safety features? There is a lot of planning, design, and science put into developing a car. There are different types of materials used to design a car, and these materials determine the durability, design, and sometimes the speed of the vehicle.

Using some exotic metals improve the aesthetics and quality of the car. If you are thinking of selling your car as scrap, you should know what cars are made of; you might even find that it is more valuable than you thought.

In this text we also have a look at some of the most expensive and hard-to-find materials used in making cars throughout history – and what they've been used for.

Fiberglass and glass aren't the same material as many people believe. Fiberglass is made of small thin strands of glass. It is mostly air and not glass. When the glass is woven in these small sheets and resin painted on it, smaller lighter things can be made. Fiberglass offers a lot of benefits in the automotive industry. It is non-corrosive, so it helps replace steel in areas where steel can get easily corroded. Fiberglass is fireproof. In case of accidents, users can get out of the car uninjured. It can be used in front bumpers, doors, roofs, casings, and the wheels.

Lead is an excellent metal because it is heavy and helps to balance the automobile. That is why most of the wheels are made of lead, aluminium, and parts of fiberglass. The battery is also made of lead, which allows it to maintain safe temperatures even when the car is heating up.

Copper is mostly used in wiring the car and any other electronic parts. The copper wires run throughout the car in different systems like the radio, safety systems, and charging points. It is also found in starters.

Titanium is an expensive metal. That is why most companies refrain from using it in their manufacturing process. However, it's the strongest metal in relation to its density, so some companies, such as Porsche, use it in metallic parts where steel and aluminium would traditionally be used because titanium allows minimising the weight of their supercars and making the cars look more aesthetically pleasing. It's also used in certain high-end car parts, most commonly sports exhaust systems.

Magnesium is used to make the body, structure, and some engine parts. It has been used in these parts since 1930. It's excellent because it's 75% lighter than steel and 33% lighter than aluminium. However, it's only used in small areas so as not to throw off the balance of the vehicles.

Yes, there is ***gold*** in your car but we don't mean rose gold or white gold panels which can be used on ostentatious cars. Gold has two important properties which make it a desirable component in the most prestigious cars. It's one of the best electrical conductors known, so it's widely used in minute quantities in connectors, switch and relay contacts, and for soldering metal joints. Tiny pieces of gold are also used in the microcomputers which power many of the electrical systems on a modern car.

Carbon is fashionable material for the automotive elite. Carbon is much stronger and lighter than steel but it's much more expensive. It can be used in many ways around a car. The most common form is carbon fibre which is used mainly in F1 cars' chassis. When blended with ceramic, it is also a component in brake discs found on many high-performance cars. A form of carbon which is, however, found on even the humblest car is carbon black. This is a compound containing tiny amounts of the material, which is added to rubber to strengthen it before it is made into car tyres. It protects the tyre surface from heat damage and makes the tyres black.

Silver is an important component in the heating element which helps clear many cars' rear and sometimes front windscreen, although this will only amount to a couple of grams per car. One hundred and forty grams of silver is used to make the badge for every model of the world's current fastest car, the Bugatti Chiron.

Rhodium is the most expensive material used in making some cars. It's mostly used in three-way catalytic converters to reduce a car's carbon emissions. So, it can be found in high-end vehicles. But many manufacturers use cheaper alternatives. For example, there is one element of a platinum alloy, which helps bring down the cost.

Exercise 14. Answer the questions.

1. What features do materials for a car design determine?
2. What do exotic metals improve in cars?
3. Is glass and fiberglass the same material?
4. Why is fibreglass used to replace steel?
5. What property of fibreglass helps to save people's life in car crashes?

6. Why is the car battery made of lead?
7. What metal is mostly used in electronic parts of a car?
8. Why does Porsche use titanium in metallic parts of their supercars?
9. What system is made of titanium in high-end cars?
10. What parts of a car are made of magnesium?
11. How long has magnesium been used in automobile production?
12. What two important properties does gold have?
13. What metal is used in the microcomputers of modern cars?
14. What material is used in production of the automotive elite cars?
15. What most common forms of carbon do you know?
16. What form of carbon is used in F1 cars' chassis?
17. What makes the tyres black?
18. What metal is an important component in the heating element?
19. Which car brand uses silver to make its hood badges?
20. Why is rhodium used in catalytic converters?

Exercise 15. Match the materials (1-10) to the parts and components of cars they can be used in (a-j).

1. Fiberglass	a. Wiring, other electronic parts, the radio, safety systems, charging points, and starters.
2. Lead	b. The body, structure, and some engine parts.
3. Copper	c. Connectors, switch and relay contacts, metal joints and the micro-computers.
4. Titanium	d. Racing cars chassis, brake discs.
5. Magnesium	e. Heating element, hood badges.
6. Gold	f. Front bumpers, doors, roofs, casings, and the wheels.
7. Carbon fibre	g. Three-way catalytic converters.
8. Carbon black	h. The battery, the wheels.
9. Silver	i. Tyres.
10. Rhodium	j. Metallic parts, sports cars exhaust systems.

Exercise 16. Read and memorize the words and word combinations.

1. announced заявленный; представленный
2. motor show автосалон; автомобильная выставка
3. wooden деревянный
4. body frame каркас кузова
5. updated обновлённый; доработанный
6. sophisticated современный, передовой
7. vintage старинный; классический; устаревшей модели
8. bhp (brake horsepower) эффективная/ тормозная мощность в л.с.
9. wire wheel колесо с проволочными спицами, спицевое колесо
10. composite alloy композиционный сплав
11. bonding соединение
12. carbon composite композиционный материал на основе углеродного волокна и карбонизированной матрицы

Exercise 17. Work in pairs. Read and translate the dialogue between two mechanics. Act it out.

Information source: *https://www.hotcars.com/cars-that-use-the-most-unusual-materials/*

Mechanic 1: I can't believe that! A car announced at the virtual Geneva Motor show in 2020 uses ash wood in its structure!

Mechanic 2: A wooden frame? No kidding? What car are you talking about?

M. 1: The updated Morgan Plus Four. It has a sophisticated aluminium chassis but still relies on a good amount of wood for the body frame.

M. 2: Well, I find Morgan a crazy brand. It often blends vintage and modern details in its cars.

M. 1: Yeah, I agree. By the way, Morgan Plus Four uses a modern BMW 2.0-liter turbo engine which produces 255 bhp. Yet it also offers wire wheels and vintage styling.

M. 2: Sounds cool! I wish I could buy it one day.

Exercise 18. Work in pairs. Read and translate one more dialogue between two mechanics. Act it out.

Information source: *https://www.hotcars.com/cars-that-use-the-most-unusual-materials/*

Mechanic 1: Pagani developed a new composite alloy for their crazy hypercars! It's carbotanium.

Mechanic 2: Carbotanium? I've never heard anything about it. What is it?

M. 1: Well, it's made by bonding titanium with carbon composites. Carbotanium is a very strong yet light alloy.

M. 2: It must be very expensive to produce.

M. 1: Yeah, it's used only in the most high-priced and extreme Pagani models – Zonda-R and Huayra, to show how exclusive this material is. Look! I've got some pictures!

M. 2: Wow! They look fantastic!

Exercise 19. Look through Unit 9 again. Make a list of the words and word combinations you consider to be the terms. Translate them into Russian.

Unit 10. TYPES OF CAR BODY STYLES

Exercise 1. Read and memorize the words and word combinations.

1. size размер; габариты
2. sedan седан (тип закрытого кузова)
3. engine compartment моторный отсек
4. passenger compartment пассажирское отделение
5. baggage compartment багажный отсек, багажник
6. thrill возбуждение, трепет
7. handling управление
8. two-seater двухместный автомобиль
9. rear seat заднее сиденье
10. station wagon = estate car многоместный легковой автомобиль (с откидными сиденьями и задним откидным бортом); легковой автомобиль с грузопассажирским кузовом; легковой автомобиль с кузовом универсал

11. tailgate задний откидной борт (автомобиля)

12. sport-utility vehicle (SUV) полноприводный автомобиль-универсал на шасси легкового автомобиля; внедорожник

13. coupe автомобиль с кузовом купе

14. slanted наклонный

15. streamlined обтекаемый

16. hatchback «хэтчбэк» (автомобиль с открывающейся вверх задней дверью); легковой автомобиль с кузовом с наклонной задней дверью

17. rear door задняя дверь

18. loading загрузка; погрузка

19. convertible кузов с убирающимся верхом, кузов со складывающимся верхом

20. spider спайдер (легковой автомобиль с открытым двухместным кузовом)

21. retract втягивать; отводить назад

22. drawback недостаток, отрицательная сторона

23. structural stiffness жёсткость корпуса или несущей конструкции

24. minivan пассажирский мини-фургон

25. sliding door раздвижная дверь

26. movable передвижной; переносный; съёмный; разборный

27. fold складываться

28. pickup truck грузовой автомобиль малой грузоподъёмности, пикап

29. cab кабина

30. side борт

31. all-wheel/four-wheel drive полный привод; полноприводный

32. off-road vehicle внедорожное транспортное средство (в правилах дорожного движения некоторых штатов определённым средствам транспорта запрещено самостоятельное движение по шоссейным дорогам); вездеход

33. paved мощёный, гравийный

34. sand песчаный

35. tread протектор (шины)

36. flexible suspension гибкая подвеска

37. caterpillar track гусеничная лента; гусеница

38. versatility универсальность

39. utility vehicle внедорожник

40. armored бронированный

41. the military вооружённые силы; войска, военная сила

42. military utility vehicle внедорожник военного назначения

43. light truck легкий грузовой автомобиль

44. hardware техника

Exercise 2. Read the international words and guess their meanings.

Model, style, type, automobile, industry, sedan, passenger, baggage, category, compact, sport, muscle, coupe, company, term, crossover, hatchback, cabriolet, structure, minivan, form, Odyssey, Accord, Mustang, Golf, pickup, asphalt, Jeep, motorized, designed, specific, function, efficacy, tanks, chassis, comfort, hybrid, electric, motor, Hector, limousine, barrier, professional, rent, American, automated, autonomous, robot, sensor, radar, LIDAR, sonar, GPS, odometry, inertial, control, system, image, navigation, information, signal, energy, battery, Tesla, Jaguar, construction, based, platform, typically, relax, transport, commercial, configure, special, modern, diesel, Cement, Mixer, Tractor, Trailer, oriented, image, pony, micro, quadricycles, popular.

Exercise 3. Read and translate Text 1. Search the Web for the pictures of the car models mentioned in the text.

Text 1. Common Types of Car Body Styles in Automotive Industry

Source: https://www.theengineerspost.com/types-of-cars-name-list/

In today's car market there are cars of different models, styles, shapes, and sizes. In this article, you'll learn about the most common types of car body styles available in the automobile industry.

The ***sedan*** is a closed-body passenger car with three separate compartments for the engine, passengers and baggage. This vehicle comes in many categories, they are available in sizes ranging from small (Nissan Versa and Kia Rio) to compact (Honda Civic, Toyota Corolla) and medium size (Honda Accord, Nissan Ultima) as well as large-size (Toyota Avalon, Dodge Charger).

A ***sports car*** is manufactured to maintain the thrill of handling, performance, or driving. They are the sportiest, most passionate, attractive, and usually high in cost. They are usually two-seaters but sometimes have smaller rear seats. The Mazda Miata and Porsche 911 are common sports cars. But muscle cars like the Ford Mustang and Dodge Challenger are also sports cars.

A ***station wagon*** is a car with a long body. It has a large luggage area and a rear tailgate. It's also known as an estate car. The examples of station wagons are Subaru Outback, Audi A4 Allroad, and sport-utility vehicles.

A ***coupe*** is a passenger two-door car with a slanted rear roof. These types of car models include the Ford Mustang, Audi A5, or two-seater sports cars like the Chevrolet Corvette and Porsche Boxster. More recently car companies have begun to apply the term 'coupe' to four-door cars or crossovers with lower, more streamlined roofs.

The ***hatchback*** is a car with rear doors that often open upward to provide easy access for loading. Not only small cars but also sports cars, SUVs, and big luxury cars can be hatchbacks. Kia Rio and Volkswagen Golf are two common hatchback cars. As to big cars, the Audi A7 and Kia Stinger are hatchbacks.

The ***convertible*** is a passenger car that can be run with or without a roof. These cars are also called cabriolets or spiders. The car's roof retracts or can be removed by hand. The drawbacks are structural stiffness and reduced baggage area. The Mazda MX-5 Miata RF, Porsche 911 Targa and Corvette are cabriolets.

Minivans are family cars. They have a high roof, flat floors, sliding doors for back passengers and movable seats in their second and third rows that can be removed or even folded into the floor to form an open baggage compartment. Honda Odyssey and Chrysler Pacifica are good examples of the minivan.

A ***pickup truck*** is a light-duty truck with an attached cab and a large open baggage area with fewer sides and a tailgate. They are all-wheel drive. Full-size and mid-size (Honda Ridgeline) are the two categories of pickup trucks.

An ***off-road vehicle*** is capable of driving on a paved or sand surface. It has large tires with deep, open treads, a flexible suspension, or caterpillar tracks. Off-road vehicles are versatile. They are commonly used in off-road racing and for driving in areas far from the asphalt. The Jeep Wrangler, Land Rover Range Rover & Ram 1500 Rebel, Haval H9 are off-road vehicles.

A ***utility vehicle*** is usually motorized, designed to perform a specific function with greater efficacy than a passenger vehicle. This sometimes refers to trucks with lower sides. The armored utility vehicle is actually used by the military and is known as a military utility vehicle. This includes military tanks, trucks, UAZ, GAZ TIGR, Mercedes-Benz G-class, etc. These types of cars are similar to a station wagon but they are built on a light-

truck chassis and have four-wheel drive like other off-road hardware.

Exercise 4. Answer the questions.

1. What types of cars are available in the automobile industry?
2. What is the distinctive feature of sedans?
3. What categories of sedans can you name?
4. Why sport cars are currently produced by many manufactures worldwide?
5. What are the examples of sport cars?
6. Does a station wagon have enough space for baggage and small cargo?
7. Are SUVs examples of station wagons?
8. Are coupe cars typically two-doors?
9. What models are coupe cars?
10. What direction does the rear door in hatchbacks open?
11. What cars can be hatchbacks?
12. How can convertibles be also called?
13. Why is a convertible perfect for an open-air driving adventure?
14. Does a cabriolet have the facility to provide a roof when needed?
15. What are the main disadvantages of cabriolets?
16. Why minivans are a good choice for big families?
17. What are the examples of minivans?
18. What is a pick-up truck?
19. Which type of car do you need to take part in off-road motorsport?
20. Why are off-road vehicles ideal for trails, paved and forest roads?
21. What military utility vehicles do you know?

Exercise 5. Match the types of cars (1-10) to the examples (a-j). Search the Web. Add more examples to each type choosing the cars available at the car market in Russia at the moment.

1. Sedan	a. Honda Odyssey, Chrysler Pacifica
2. Sports car	b. Ford Mustang, Audi A5, Chevrolet Corvette, Porsche Boxster
3. Station wagon	c. Military tanks, trucks, UAZ Patriot, GAZ TIGR
4. Coupe	d. Mazda MX-5 Miata RF, Porsche 911 Targa and Corvette
5. Hatchback	e. Honda Ridgeline, Dongfeng DF6
6. Convertible	f. Jeep Wrangler, Land Rover Range Rover & Ram 1500 Rebel, Haval H9
7. Minivan	g. Nissan Versa, Kia Rio, Honda Civic, Toyota Corolla, Honda Accord, Nissan Ultima, Toyota Avalon, Dodge Charger
8. Pickup truck	h. Kia Rio, Volkswagen Golf, Audi A7, Kia Stinger
9. Off-road vehicle	i. Mazda Miata, Porsche 911, Ford Mustang, Dodge Challenger
10. Utility vehicle	j. Subaru Outback, Audi A4 Allroad, SUVs

Exercise 6. Have a group discussion. What type of car body styles do you prefer? Why? If you have a car, tell what type it is. Do you find it convenient? Why/Why not?

Exercise 7. Work in pairs. Read and translate the dialogue between two students. Act it out.

Student 1: When you look at the car, the first things you pay attention to are its shape, body style, size, number of seats and doors.

Student 2: Yeah, there are so many cars of different models in today's car market. It's so difficult to understand all this.

S. 1: I can help you, if you want. I am good at types of car body styles.

S. 2: Great! Well, I can easily distinguish the common ones from others. I mean minivans, off-road vehicles, sedans, convertibles and sports cars. But I sometimes have difficulty distinguishing coupes.

S. 1: Oh, it's because the car manufactures have started to apply the term 'coupe' differently. You see, in the past the word coupe was used to describe a horse-drawn four-wheeled enclosed carriage for two passengers with no rear seats. So, a coupe is originally regarded as a car with a fixed roof, a sloping rear and typically two doors. But recently many four-door cars, especially the ones with coupe-like look of their roofs, have also been sold as coupes.

S. 2: Hmm… I see now. By the way, I've read that the sedan was first used as a name for the car body in 1912. This name comes from a sedan chair which is an enclosed chair with windows for one person carried on two poles by two men, one in front and one behind.

S. 1: You're absolutely right. Sedan chairs were used in the 17th and 18th centuries. Any more questions about the car body styles?

S. 2: Yes, what about hatchbacks? Does this term refer only to small cars?

S. 1: No, it doesn't. In the United States, when the car's body style is described as a hatchback, it usually refers to a utilitarian small car. Also, compact hatchbacks are popular in European countries. However, a number of sports cars, SUVs and even big luxury cars have hatchback body style nowadays.

S. 2: Okay. And I have a question about pick-ups. Are they passenger cars?

S. 1: Not really. I mean pick-ups are light-duty trucks. However, now in North America, pickup trucks are often used as passenger cars and account for about 18% of the vehicles sold in the USA.

S. 2: Hmm, it's really interesting! Thanks a lot for your help.

Exercise 8. Read and memorize the words and word combinations from Text 2.

1. luxury vehicle автомобиль высшего класса
2. enhanced улучшенный, повышенный
3. hybrid car легковой автомобиль с гибридным приводом
4. light-hybrid vehicle
5. pure hybrid vehicle
6. limousine лимузин (модель автомобиля)
7. long-wheelbase увеличенная, удлинённая колёсная база
8. stretch limousine длинный лимузин
9. self-driving car автономный (самоуправляемый) автомобиль
10. LIDAR (Light Detecting And Ranging) лидар, лазерный радар ИК-диапазона (применяется в робототехнике, позволяет в динамике строить сложные 3D-модели окружающей среды)
11. sonar (sound navigation ranging) гидролокатор, сонар
12. GPS (Global Positioning System) глобальная система навигации и определения положения
13. odometry одометрия (измерение пройденного расстояния)
14. inertial инерционный
15. measurement unit измерительное устройство
16. advanced control system усовершенствованная система управления

17. obstacle помеха, преграда, препятствие
18. relevant signal ожидаемый сигнал
19. pony car малогабаритный двухместный легковой автомобиль
20. performance-oriented ориентированный на производительность
21. highly-styled стильный, с отличным дизайном
22. rear-wheel drive передача на задние ведущие колёса; задний привод
23. hood капот
24. decklid крышка багажника
25. electric vehicle электромобиль (автомобиль без двигателя внутреннего сгорания, с приводом колёс от электродвигателей, питающихся от аккумулятора)
26. unibody construction несущая конструкция, безрамная конструкция; конструкция с несущим кузовом
27. off-road capability повышенная проходимость; способность передвигаться в условиях бездорожья
28. truck грузовой автомобиль, грузовик
29. cc (cubic capacity) рабочий объём (двигателя)
30. bubble car мини-автомобиль с прозрачной крышей
31. bicycle car веломобиль
32. invacar трёхколёсная мотоколяска
33. quadricycle сверхмалолитражный четырёхколёсный автомобиль
34. voiturette малолитражный автомобиль
35. Kei car кей-кар (категория компактных автомобилей в Японии, пользующихся налоговыми и др. льготами)

Exercise 9. Read and translate Text 2. Search the Web for the pictures of the car models mentioned in the text.

Text 2. Other Vehicle Options in Modern Automotive Industry

Source: https://www.theengineerspost.com/types-of-cars-name-list/

A ***luxury vehicle*** offers enhanced levels of comfort, equipment, features, quality, performance and condition for a large price. Most of the luxury cars are large vehicles, although smaller sport-oriented models and compact luxury vehicles are in high demand now. The cheapest luxury cars are Buick Encore, Acura ILX, Buick LaCrosse, Buick Envision, Lexus UX, etc.

Hybrid cars are environmentally friendly and offer superior performance. They commonly have a petrol engine and an electric motor. They are expensive. There are light-hybrid and pure hybrid vehicles. MG Hector, Toyota Glanza, Toyota Camry, Honda Accord are the models of hybrid vehicles.

A ***limousine*** or a limo is a large luxury vehicle operated by Chauffeur with a barrier between the driver's compartment and passenger compartment. A long-wheelbase luxury sedan with two or more doors run by a professional driver is called a stretch limousine. Limousines are usually used by very rich or important people. In Russia people rent limousines to celebrate a special event. In the United States, Germany, Canada, a 'limousine service' normally means a pre-booked rental car with a driver, regardless of the type of vehicle. In the USA a large vehicle to take passengers to and from the airport is also called a limousine. The Batmobile, American Dream, Beast, Midnight Rider and Toyota Century Royal are the very expensive type of limousines.

A ***self-driving car*** is a fully automated vehicle. It is able to sense the environment and driving safely without a driver. They are also known as autonomous vehicles (AV), driverless cars, or robot cars. They use a variety of sensors to reflect their surroundings,

such as radar, LIDAR, sonar, GPS, odometry, and inertial measurement units. Advanced control systems describe proper navigation paths, as well as sensor information to identify obstacles and relevant signals.

The ***Pony car*** is an American kind of car with a performance-oriented image for a cheap, compact, and highly-styled coupe or convertible. These types of cars have a rear-wheel drive, a longer hood and a shorter decklid. The currently produced pony cars are Mustang, Chevrolet Camaro and Dodge Challenger.

Electric cars are powered by one or more electric motors using the energy stored in rechargeable batteries. The first working electric cars were manufactured in the 1880s. Electric vehicles (EVs) need to charge their batteries. They are environmentally friendly because they reduce carbon pollution. Tesla Model 3, Kia e-Niro, Jaguar I-Pace, Kia Soul EV, and Hyundai Kona Electric are EVs but they are high in cost.

A ***crossover*** is a type of sport utility vehicle (SUV) with unibody construction. They are also called crossover utility vehicles (CUV). Crossovers are usually based on a platform of a passenger car. As compared to truck-based SUVs, they typically have good internal comfort, a more relaxed ride, better fuel consumption, and lower off-road capability. There are disagreements about whether some vehicles are considered crossovers or SUVs. Therefore, the term SUV is frequently used as a catch-all for both crossovers and compact SUVs. For example, in the United States in 2006, the crossover models included more than 50% of the total SUV market. Citroen C3 Aircross, Volkswagen T-Cross, Kia Stonic, Mazda CX-3, Changan Uni-K and Seat Arona are the models of crossover.

A ***truck*** is a motor vehicle produced to transport cargo. Trucks differ greatly in size, power, and shape. They are also called lorries. Commercial trucks are rather large and powerful and can be configured to be mounted with special equipment. Modern trucks mostly have diesel engines, although small to medium-sized trucks may have gasoline engines. Dump Truck, Cement Mixer, Tractor-Trailer, Flatbed are the types of trucks.

The ***microcar*** is a term often used for the smallest size of cars, consisting of three or four wheels and often smaller engines than 700 cc. Common types of microcars include bubble cars, bicycle cars, invacar, quadricycles, voiturettes and the Japanese equivalent is the Kei car. Most of the microcars are powered by petrol or diesel engines, although electric-powered microcars have become more popular in recent years.

Exercise 10. Answer the questions.

1. What are the main features of a luxury car?
2. Why have car companies developed hybrid cars?
3. Why are hybrid cars called so?
4. What is a limousine?
5. Does a ‘limousine service’ in Germany provide only limos?
6. Do real limos carry people to and from an airport in the USA?
7. What is a pony car?
8. How are electric cars powered?
9. When were the first EVs manufactured?
10. What is a crossover?
11. What do SUV and CUV stand for?
12. What are the typical features of crossovers?
13. What is the term SUV frequently used for?
14. How is a large road vehicle used for carrying goods, materials, or troops called?
15. What engines do trucks have?
16. What do common types of microcars comprise?

Exercise 11. Have a group discussion. Answer the questions.

1. Would you like to have a hybrid car? Why? / Why not?
2. Have you ever rented a limousine? What was the event? Did you like the ride?
3. What are the advantages and disadvantages of driving electric cars in Siberia?
4. Are there many microcars in Russia? Would you like to buy one? Why? / Why not?
5. Are there any self-driving cars in Russia? What do you think of them?

Exercise 12. Work in pairs. Read and translate the dialogue between a customer and a car salesman. Act it out.

Salesman: Good morning! How can I help you?

Customer: Morning. I'm looking for a new car.

S.: Great! Do you have any preferences in cars?

C.: Yes, I do. Well, at the moment I've got a medium size crossover Changan Uni-K. It's nice. But I feel I need a bigger car for all my family to travel together.

S.: Okay. And how big is your family?

C.: There are six of us. My wife and I have four kids.

S.: Yeah, it's really a big family! I think I can offer you the restyled version of the premium minivan GAC GN8. I'm sure it's a good choice for you. It competes with Toyota Alphard and Volkswagen Multivan models. And it has enough extra space for luggage in case you would like to travel for long distances.

C.: That sounds great! We go to Altay and Tomsk region two or three times a year to visit our relatives.

S.: Okay. This way, please! I'll show you one.

Exercise 13. Choose one type of car body style from Texts 1 and 2. Make a presentation about it.

Exercise 14. Look through Unit 10 again. Make a list of the words and word combinations you consider to be the terms. Translate them into Russian.

Unit 11. CAR BODY PARTS: EXTERIOR

Exercise 1. Read and memorize the words and word combinations.

1. exterior внешний вид
2. axle мост; ось; полуось
3. suspension подвеска
4. body shell корпус кузова (каркас с панелями и полом)
5. fit умещать
6. hood/bonnet капот
7. hinged шарнирный, соединённый шарнирно, шарнирно сочленённый
8. cover крышка
9. coolant охлаждающая жидкость; охладитель; хладагент
10. fluid жидкость
11. cooling fan охлаждающий вентилятор
12. alternator генератор переменного тока
13. latch защёлка (капота)
14. collision столкновение
15. impact воздействие; толчок; удар

16. rear bumper задний бампер
17. trunk багажник
18. grille облицовка радиатора
19. fuel system топливная система
20. exhaust system система выпуска отработавших газов
21. bumper grille решётка переднего бампера; радиаторная решётка
22. engine bay моторный отсек; двигательный отсек
23. number plate номерной знак (на автомобиле)
24. crash guard/bull bar передняя решётка из труб, защищающая при столкновении с крупными животными; кенгурятник; переднее защитное ограждение
25. heavy-duty сверхпрочный
26. shield щит; защита; защитное средство
27. fender крыло
28. curved part фасонная деталь; деталь с криволинейным профилем
29. passenger compartment пассажирское отделение; салон автомобиля
30. roof крыша
31. headliner обшивка потолка в салоне
32. insulation изоляция
33. sunroof прозрачный люк в крыше автомобиля
34. maintenance техническое обслуживание и текущий ремонт
35. spoiler спойлер
36. door дверь; дверца
37. door handle дверная ручка
38. wheel колесо
39. rotary motion поворотное движение, вращательное движение
40. tire шина
41. road grip сцепление шин с дорогой
42. hubcap колпак, крышка (закрывающая центральную часть колеса)
43. mud flap брызговик

Exercise 2. Read the international words and guess their meanings.

Function, global, model, style, transmission, differential, idea, discuss, chassis, mechanical, electrical, system, design, component, passenger, type, motor, battery, compressor, protect, bumper, absorb, physical, basic, aluminum, plastic, radiator, ventilation, spray, top, occupant, antennas, accessory, locate, sedan, coupe, natural, laminated, exterior, minivans, modified, form, ventilate, create, panel, mechanisms, registration, illuminate, aspect, parking, lamp, situation, selectively, filter, specific, indicator, orange, react, adapt, signal, confuse, effective.

Exercise 3. Read and translate Text 1.

Text 1. Names and Functions of Main Car Body Parts

Source: https://www.theengineerspost.com/parts-of-car-body/

In the 20th century, cars came into global use and became widely available in different models and styles. When you open your car hood up or see the down of your car, you usually find the internal parts of the car such as the engine, transmission, axles, differential, suspension, etc. But what about the external parts? Many people do not have any idea of them. Therefore, we have brought you the list of exterior car body parts and their functions. So, let’s discuss them one by one.

The vehicle ***body shell*** is the body of a car that rests in the chassis and fits the engine, mechanical and electrical systems, seats, etc. It is designed to carry the weight of all car components and passengers.

The car ***hood*** is also known as a ***bonnet*** in some countries. This is the type of thin hinged sheet cover over the engine of motor vehicles. It includes engine, battery, coolant, windscreen fluid, cooling fan, compressor, alternator, etc. The hood protects these parts from direct sunlight and dust. Also, it allows direct access to the engine compartment for maintenance and repair purposes. There is a hidden latch to hold the hood securely when you're taking a look inside your car.

The ***front bumper*** protects your car in case of a sudden collision. It absorbs most of the impact during low-speed collisions to prevent serious damage to the driver, vehicle, and passengers. The ***rear bumper*** is designed to prevent heavy damage when you hit an obstacle while taking a reverse turn. It reduces or prevents physical damage to the front and rear sides of vehicles in low-speed accidents. It is basically made of steel, aluminum, rubber, or plastic and protects the trunk, grille, fuel, exhaust, and cooling systems. The ***bumper grille*** covers the front body of the vehicle, protects the radiator which allows your engine to keep cool. When you drive your car, it sucks the air through the grille which serves to provide ventilation through the engine bay. A ***number plate*** is a sign on the front and back of a vehicle that shows its registration number.

The ***crash guards*** or ***bull bars*** are mounted to the front frame or chassis of the SUVs mostly to provide real protection in case of an accident. They are typically made of heavy-duty steel and can effectively shield the front end of the vehicle. Moreover, the design of this accessory gives a stylish look to your vehicle.

The ***fender*** is the curved part of the car's body over the wheels that holds them in place. It is not only a safety component but also enhances the overall look of your vehicle. Its primary function is to shield and protect the passenger compartments by preventing sand, mud, rocks, liquids, and other roads spray from being thrown into the air by the rotating tire.

A ***roof*** is the top part of a vehicle that sits above the passenger compartment, protecting the vehicle occupants from sunlight, wind, rain, etc. The car ceilings are typically coated with headliners that provide insulation against heat and noise, and also hide wires and hardware for electrical components, antennas, and other accessories. The ***sunroof*** gives passengers a clear view of the sky, keeps the car ventilated, and lets the sunlight in, creating a feeling of open space. It's a panel in the roof of a car that either slides or can be pulled out. It's quite expensive to make it because all the mechanisms that operate it cost a lot. Besides, the rubber, glass, motor, and all other components require frequent maintenance.

The ***trunk*** is the main storage or luggage compartment. It is often located at the rear of sedans, coupes, or convertibles. It is used for carrying goods. So, keep in mind that the more luggage you load, the more fuel the engine consumes.

A ***spoiler*** is an object which forms part of the body of a car. It changes the flow of air around the vehicle, making a car's forward movement more efficient.

A ***door*** is a type of opening, usually hinged on the exterior of a vehicle. Doors often include windows for visibility and can be locked from inside to secure the vehicle. These are operated manually or with the help of power supplied by the vehicle. Power doors are used in minivans, luxury vehicles, or modified cars. ***Door handles*** help the driver or passengers to get in or out of the car. They contain door locks. There are different types of door handles according to the car model.

The ***wheels*** are the most basic and important parts of a car body that have always been in use. They have circular forms that generate rotary motion and are responsible for moving the car from one point to another. The ***tire*** is the rubber part that wraps around the

wheel and provides the road surface grip. A ***hubcap*** is a metal or plastic disc that covers and protects the centre of a wheel on a car, truck, or other vehicle.

Mud flaps are meant to catch mud, dirt, rocks, salt, water and other elements on the road and ensure that they don't fly straight into your vehicle from back and front.

Exercise 4. Answer the questions.

1. What external parts of a car can you name?
2. Which part of a car handles the weight of passengers and all components in a car?
3. Where is the hood located?
4. What is the function of the bonnet?
5. What parts protect a car when it collides with anything?
6. What is a rear bumper made of?
7. What is the key role of the bumper grille?
8. Which part of a car gives a unique identity to the vehicle?
9. Why are such cars as SUVs have a crash guard?
10. Which car body parts are located over the wheels?
11. What is the primary function of fenders?
12. Does the car roof sit above the passenger compartment?
13. What role does a headliner play?
14. What is a sunroof?
15. Why is the sunroof regarded as a high maintenance part of the car body?
16. What is the main storage or luggage compartment in a car?
17. What is a spoiler?
18. What do car doors include?
19. What type of cars have power doors?
20. Which parts of a car body are the circular objects fixed underneath a car and enable it to move along the ground?
21. How is a decorative disc on an automobile wheel called?
22. Why is it necessary to get mud flaps for your vehicle?

Exercise 5. Match the car body parts (1-17) to their Russian equivalents (a-q).

1. body shell	a. капот
2. number plate	b. багажник
3. roof	c. переднее защитное ограждение
4. bumper	d. корпус кузова
5. spoiler	e. дверь; дверца
6. wheel	f. радиаторная решётка
7. trunk	g. брызговик
8. tire	h. номерной знак
9. hood/bonnet	i. крыло
10. bumper grille	j. бампер
11. hubcap	k. прозрачный люк в крыше автомобиля
12. mud flap	l. дверная ручка
13. sunroof	m. колпак на колесо
14. door	n. крыша
15. fender	o. шина
16. door handle	p. колесо
17. crash guard/bull bar	q. спойлер

Exercise 6. Read and memorize the words and word combinations.

1. headlight фара (на передней части транспортного средства)
2. fatigue-free безусталостный
3. lower beam ближний свет фар
4. high beam дальний свет фар
5. taillight задний габаритный фонарь
6. parking brake стояночный тормоз
7. fog lamp противотуманная фара
8. beam луч; излучение; свет фар
9. dazzle ослепление, ослепляющее действие; слепить, ослеплять
10. indicator light сигнальная лампочка; боковой фонарь, установленный на переднем крыле и работающий одновременно с передним и задним указателями поворота
11. turning поворот; разворот
12. side-view mirror боковое зеркало заднего вида
13. blind spot участок обзора, закрытый от водителя; слепая зона
14. window glass оконное стекло
15. sunlight солнечный свет
16. artificial street lighting искусственное уличное освещение
17. single-layer toughened glass однослойное упрочненное стекло
18. laminated safety glass многослойное защитное стекло
19. windshield ветровое (лобовое) стекло
20. quarter window поворотная форточка; заднее боковое окно в кузове; треугольная форточка салона
21. peek быстрый взгляд
22. speed up увеличивать скорость, ускорять(ся)
23. debris мусор; грязь; инородные частицы
24. degradable подлежащий износу

Exercise 7. Read and translate Text 2.

Text 2. Lights, Mirrors and Windows

Source: https://www.theengineerspost.com/parts-of-car-body/

The primary function of ***headlights*** is to illuminate the road and facilitate fatigue-free and safe driving. They are attached to the front end of the vehicle. They allow the driver to see the roadway in the dark and to indicate to other drivers that a car is present. There are two types – low beam and high beam.

The ***taillights*** consider the safety aspect of the vehicle. They allow your vehicle to be seen during low visibility conditions and alert other drivers that you are slowing down. On most vehicles, the tail light is red and the brake light is brighter red. The taillights stay ON when you turn ON your headlights or when your parking brake is ON. The brake light will light up as soon as you apply pressure to the brakes. So, the brake light and tail lights are not the same.

The purpose of ***fog lamps*** is to allow brightness in situations when visibility is less than 100m. They help to illuminate the road surface under the fog and prevent the additional beams from the fog. There are mainly two types of fog lamps – front fog lights and rear fog lamps. Most of front fog lights are selectively yellow because it filters out the blue component of white light, which causes the most shine. The rear fog lamps are more useful than front ones. They are a bright red light (similar to a brake light) that is lit in poor visibility to make the vehicle more specific for low traffic. They are useful when you are

driving much slower than usual and when a vehicle is behind you, they can dazzle other drivers to stop.

Indicator lights can be red, orange and white. They can be located on the front, rear, and sometimes on both the left and right sides of the car. These are used to indicate a desired change of direction, whether turning left or right or going out into traffic. You need to use them at right time to give other drivers enough time to react and adapt to your signal. Once you have completed the turn make sure the indicator is off otherwise it may confuse other drivers.

Side-view mirrors are also known as wing mirrors. These mirrors are located on the exterior of the vehicles to help the driver see areas behind and get a wider view of each side of the car. So, they reduce blind spots. Side mirrors are used for manual or remote vertical and horizontal adjustments to afford enough coverage to drivers of varying heights and seating positions.

The basic reason for the use of ***window glass*** at the front, side, or rear of the car is visibility. It allows passengers to see where they are going and allows natural sunlight or artificial street lighting to enter the vehicle. There are usually two types of window glass – single-layer toughened glass or laminated safety glass.

A ***quarter window*** is a type of a side window that is located before the front door glass or after the rear door glass. It provides a peek of the road around the vehicle so that the driver can turn, speed up, park, or change lanes safely. These small, usually triangular in shape, windows at the front are often found on older vehicles.

The ***windshield*** of a car or other vehicle is the glass window at the front through which the driver looks.

Almost all vehicles including cars, trucks, buses, etc. have ***wiper blades***. They are used to clear snow, water, and/or debris from the vehicle's front window so that the driver can see what lies ahead to escape accidents. They are made of rubber that is degradable and becomes less effective over time. That's why it's important to replace them every 6-12 months.

Exercise 8. Match the car body parts (1-9) to their functions (a-i).

1. headlight	a. a rear-view mirror projecting from the side of a motor vehicle
2. taillights	b. a hard, transparent substance used to make car windows
3. fog lamp	c. a powerful light at the front of a motor vehicle
4. indicator lights	d. a glass screen at the front of a motor vehicle through which the driver can see the road
5. side-view mirror	e. a small usually triangular in shape side window at the front door or after the rear door
6. window glass	f. the two red lights at the back of a car or other vehicle
7. windshield	g. a device that wipes rain from a vehicle's windscreen
8. quarter window	h. a bright light on a motor vehicle, used in foggy conditions to improve road visibility or warn other drivers of one's presence
9. wiper blades	i. red, orange or white lights used to indicate that a driver wants to turn to the right or left

Exercise 9. Read Texts 1 and 2 again. Put all the exterior car body parts in three groups according to the place where they are located: front of a car, rear of a car and side of a car.

Exercise 10. Have a group discussion. Answer the questions.

1. What accessories can be often seen on cars in Russia?
2. Do you find it prestigious to have a car with a bull bar? Why? / Why not?
3. Do you think the design of hubcaps gives a stylish look to a vehicle? Why? / Why not?
4. What are the advantages and disadvantages of having tinted glass windows in a car?
5. Would you like to have headlights with wipers? Why? / Why not?
6. Is it convenient to use headlights with the vertical adjustment of the light beam? Why? / Why not?

Exercise 11. Work in pairs. Read and translate the dialogue between a customer and a car mechanic. Act it out.

Mechanic: Hi! I haven't seen you for ages? Anything wrong with your car?

Customer: Hello. No, my car is fine. I'm here with my wife's car. The front bumper needs to be replaced.

M.: Front bumper?!!! What happened? Did she have a car accident?

C.: Oh, no, she didn't. Thanks God! You see, she's never been good at parking…

M.: Okay. Let me have a look at the bumper.

C.: Yes, sure.

M.: Well, the right side of the bumper is completely broken. But the grill and plate number are okay. And there is a small dent on the right fender.

C.: Did the paint get scratched off a lot?

M.: Yes, it did. And I can see some more deep scratches at the bottom of the fender.

C.: What about the lights?

M.: The left headlight looks fine. But I can see a tiny crack in the right one. Switch on the headlights, please! I want to check if the bulbs are working or not.

C.: Just a moment! Done!

M.: Okay. They are all right.

C.: Can you see any other damages?

M.: No, that's all.

Exercise 12. Search the Web for the pictures of the most important car exterior parts mentioned in the texts. Make a presentation about them. As an option, you may talk about your car.

Exercise 13. Look through Unit 11 again. Make a list of the words and word combinations you consider to be the terms. Translate them into Russian.

Unit 12. TYPES OF CAR INTERIOR PARTS

Exercise 1. Read and memorize the words and word combinations.

1. interior интерьер, внутренняя часть
2. interior design дизайн интерьера
3. easy-to-use лёгкий (простой) в пользовании (эксплуатации)
4. good looking имеющий красивый внешний вид
5. driver seat сиденье водителя
6. passenger seat пассажирское сиденье
7. seat belt ремень безопасности

8. adjust налаживать, регулировать
9. steering/driving wheel, handwheel рулевое колесо; руль
10. steering control рулевое управление
11. horn гудок; клаксон
12. audible sound слышимый/громкий звук
13. pedestrian пешеход
14. knob кнопка
15. dashboard приборный щиток; приборная панель
16. instrument прибор; устройство
17. controls средства управления
18. airbag подушка безопасности
19. rear-view mirror зеркало заднего вида
20. stick shift автомобиль с ручной коробкой передач; рычаг переключения передач, скоростей
21. manually ручным способом, вручную
22. console консоль; пульт управления
23. shift lever рычаг переключения
24. linkage рычажный механизм
25. handbrake, emergency/parking brake ручной тормоз
26. handheld ручной
27. lever рычаг
28. clutch pedal педаль сцепления
29. manual/mechanical transmission механическая трансмиссия
30. transmission of power передача энергии
31. transmission коробка передач; трансмиссия
32. brake pedal тормозная педаль
33. accelerator/gas pedal педаль акселератора, педаль газа
34. accelerate ускорять ход, увеличивать скорость; разгоняться
35. air ventilation вентиляция
36. air conditioner (AC) кондиционер
37. air recirculation циркуляция воздуха в замкнутом цикле
38. fresh air свежий воздух; воздух с улицы
39. air duct воздухопровод; воздушный канал
40. mode режим; способ
41. glove/storage compartment ящик для мелких вещей, бардачок
42. footwell ниша для ног
43. cup/beverage holder держатель для чашки
44. floor carpet коврик на полу салона или кабины автомобиля

Exercise 2. Read the international words and guess their meanings.

Interior, comfortable, control, parking, passenger, comfort, install, complex, navigation, system, ventilation, type, radio, model, conditioner, method, recirculation, design, electronically, modern, panel, instrument, automatically, pedal, press, transmission, accelerator, gas, standard, center, console, parking, device, restaurant, unhygienic, regularly, safe, stop, speedometer, display, motor, signal, indicator, audio, information, technology, progress, cassette, CD, DVD, smartphone, controller, Android, Auto, activate, start, cabin, location, Ford, Lincoln, super, traditional.

Exercise 3. Read and translate Text 1.

Text 1. Names and Functions of Car Interior Parts

Source: https://www.theengineerspost.com/car-interior-parts/

Car manufactures pay a lot of attention to the interior design of their cars. All the car interior parts must be comfortable, easy-to-use and good looking. Let's consider the parts of the car interior one by one.

A car interior system has a ***driver seat*** and ***passenger seat*** with a seat belt. The person who drives the car sits in the driver's seat. The passenger seat is located on the side of the driver's seat where the car passenger sits. A ***seat belt*** is a vehicle safety device that helps to keep you safe and secure inside your vehicle during an accident or a sudden stop of the vehicle. The seat belts adjust electronically in modern cars.

A ***steering wheel*** is a type of steering control in cars. It is also known as the ***driving wheel*** or ***handwheel***. It is the part of the steering system that is controlled by the driver. The driver rotates it in order to steer a vehicle. It has a ***horn device*** that produces audible sounds to get the attention of nearby vehicles and pedestrians. Also, some convenient knobs to adjust the radio, heat, and air conditioning can be available on the steering wheel in certain models.

A ***dashboard*** in a car is the panel facing the driver of a vehicle. It contains instruments and controls.

An ***airbag*** is a safety device in a car which automatically fills with air if the car crashes, and is designed to protect the people in the car when they are thrown forward in the crash.

A ***rear-view mirror*** is designed to allow the driver to see the traffic behind while driving. It adjusts electronically in certain models of modern cars.

Vehicles with a manual or standard transmission are usually referred to as a stick shift. The driver uses a ***stick shift*** to manually shift gears as they accelerate and slow down their vehicle. It is located on the center console of the car. The shift lever is joined to the transmission by a linkage.

The ***emergency*** or ***parking brake*** or ***handbrake*** acts like a handheld lever for immediate braking. It is used to prevent the car from rolling forward or backward while it is parked. It is situated on the center console.

If you've ever driven a car, then you're familiar with pedals. The ***clutch pedal*** is only found in manual transmission type cars. It is found on the floor to the left side of the brake pedal. When it is pressed by the driver, it closes the clutch which ends the transmission of power from the engine to the transmission. And when it is released, it simply applies power through the transmission. *A* ***brake pedal*** is located on the floor to the left of the accelerator pedal. When it is pressed by the driver, it applies the brakes, causing the vehicle to slow down and/or stop. You must use your right foot to apply force on this pedal. The ***accelerator pedal*** is also known as the ***gas pedal***. It is found on the floor on the right side. It controls the amount of gas being pumped into the engine and thus controls the speed of the vehicle. Slowly push the gas pedal while your car is accelerating.

Nowadays most vehicles are equipped with ***air ventilation***. It is also known as the ***air conditioner***. Usually, it is available in two methods. In the air recirculation method, the AC system re-circulates the air inside the car for cooling purposes. In the fresh air method, it brings outside air into the car by opening an air duct at the front of the vehicle. Both modes have their benefits and drawbacks.

A ***glove*** or ***storage compartment*** is built into the dashboard, above the footwell of the front passenger seat. It is used for storing small items. It is also known as a glove box. The name originated from the purpose of the compartment to store driving gloves.

A ***cup*** or ***beverage holder*** is a device used as a car restaurant table or car drink holder while traveling. It can be used to hold drinks, food, and any small things you want to keep.

Dirt from our shoes can be spread inside the car, creating an unhygienic environment that really smells. A ***floor carpet*** can protect the floor from dust and water. Floor carpets must be cleaned regularly.

Exercise 4. Answer the questions.

1. What parts of the car interior do you know?
2. What seats can you find in a car?
3. Why do drivers and passengers need to fasten their seat belts while driving?
4. What are two other options to name a steering wheel?
5. What is the function of a driving wheel?
6. What does a handwheel have?
7. What is a dashboard?
8. Why is an airbag regarded as a safety device?
9. What is a rear-view mirror used for?
10. What role does a stick shift play?
11. What are the synonyms for an emergency brake?
12. When do drivers use a handbrake?
13. What pedals are there in a car?
14. What are the functions of the pedals?
15. What are the two modes of air conditioning systems in cars?
16. Where is a storage compartment situated?
17. Why is it also called a glove box?
18. Where can you put a cup of coffee in a car?
19. Why is a set of floor carpets highly desirable for any car owner?

Exercise 5. Match the car interior parts (1-13) to their functions (a-m).

1. air conditioner	a. a small angled mirror fixed inside the windscreen of a motor vehicle enabling the driver to see the vehicle or road behind
2. airbag	b. a device for holding a plastic cup or other drinking container
3. horn	c. the lever that you use to change gear in a car or other vehicle
4. pedal	d. the wheel which the driver holds when he or she is driving
5. glove compartment	e. a safety device fitted inside a car, consisting of a cushion designed to inflate rapidly and protect passengers from impact in the event of a collision
6. steering wheel	f. a brake operated by hand, used to hold an already stationary vehicle
7. dashboard	g. a lever that you press with your foot in order to control the car
8. rear-view mirror	h. the panel facing the driver's seat where most of the instruments, gauges and switches are
9. stick shift	i. the device that makes a loud noise as a signal or warning
10. cupholder	j. a sitting place for a passenger in a vehicle
11. parking brake	k. a strap attached to a seat in a car; you fasten it across your body in order to prevent yourself being thrown out of the seat if there is a sudden movement
12. passenger seat	l. a small cupboard or shelf below the front windscreen, in the dashboard, used for storing small things
13. seat belt	m. a machine which keeps the air in a car cool and dry

Exercise 6. Read and memorize the words and word combinations.

1. gauge/gage контрольно-измерительный прибор; датчик
2. switch выключатель; переключатель
3. controls средства управления
4. feature характерное свойство; особенность; деталь; часть
5. rear-view/reversing camera камера заднего вида
6. in-car entertainment мультимедийная развлекательная система в автомобиле
7. speedometer спидометр; одометр
8. fuel gauge измеритель горючего; топливный расходомер, бензиномер
9. turn signal сигнал поворота
10. turn light фонарь указателя поворота
11. arrow стрелка
12. turn signal lever переключатель указателя поворота
13. car audio system автомобильная аудиосистема
14. entertainment развлечение
15. AM radio (amplitude modulation radio) AM-приёмник; радиовещание, использующее амплитудную модуляцию сигнала
16. FM radio (frequency modulation radio) FM-приёмник; радиовещание, использующее частотную модуляцию сигнала
17. tape player магнитофонный плейер
18. cassette player кассетный плеер, аудиоплеер
19. record player проигрыватель
20. CD player (compact disk player) CD-плеер, плеер для компакт-дисков
21. DVD player проигрыватель DVD-дисков, DVD-плеер
22. Blu-ray player Blu-ray-плеер, проигрыватель Blu-ray-дисков (формат оптического диска нового поколения, следующий за DVD)
23. navigation system навигационная система
24. Smartphone Controller контроллер (прибор управления)
25. CarPlay система, позволяющая использовать iPhone в автомобиле, не отвлекаясь от дороги. Подключив iPhone к CarPlay, можно пользоваться системой спутниковой навигации, делать звонки, отправлять и получать сообщения, слушать музыку и делать многое другое.
26. Android Auto («Андроид Авто») программа, с помощью которой можно подключить смартфон к дисплею автомобиля и получить доступ к приложениям, медиатеке, списку контактов и другим данным вашего устройства
27. emergency flasher аварийная мигающая сигнальная система
28. warning light предупреждающий световой сигнал
29. hazard light аварийная световая сигнализация
30. turn signal light сигнал поворота, поворотник
31. control panel приборный щиток; панель управления
32. blower вентилятор
33. cooling medium охлаждающий агент, закалочная среда, хладагент
34. ventilation opening вентиляционное отверстие
35. door panel дверная панель
36. power window switch выключатель управления электрическим стеклоподъёмником дверей
37. power window control управление электрическим стеклоподъёмником дверей
38. handle ручка
39. door lock дверной замок

40. door lock knob кнопка дверного замка

41. innovation новинка

42. bucket seat ковшеобразное сиденье

43. custom-shaped по специальному заказу; нестандартный; индивидуального изготовления

Exercise 7. Read and translate Text 2.

Text 2. Instruments, Gauges and Switches

Source: https://www.theengineerspost.com/car-interior-parts/

Cars have their own controls for driving, parking, passenger comfort, and different types of lighting. Over the years, additional features and controls have been installed in vehicles, making them more complex, but also safer and easier to operate. They include reversing cameras, air conditioning, navigation systems, and in-car entertainment, ventilation controls, mirrors, and more that we'll cover in this article.

A ***speedometer*** is a device that measures and displays the speed of a car. This instrument is located on a vehicle's dashboard.

A ***fuel gauge*** is a device used to indicate the amount of fuel in a fuel tank. They are perfectly suitable for motor vehicles; they began to be available as standard equipment at the beginning of the 20th century.

A ***turn signal*** is an indicator on a vehicle. The car is equipped with turn lights at all four corners. Inside a car, these signs usually appear as green arrows in the direction of the expected turn. In some vehicles, the ***turn signal lever*** is found on the left side of the steering wheel. It works as if moving the lever up indicates a right turn and moving it down indicates a left turn.

Car audio system is also an essential part of a car interior that serves in-car entertainment and information for vehicle passengers. In the early 1950s, it contained a simple AM radio. As technology progressed, it came with FM radio, 8-track tape players, cassette players, record players, CD players, DVD players, Blu-ray players, navigation systems, and smartphone controllers such as CarPlay and Android Auto.

Emergency flashers are visible warning lights mounted on a vehicle. They are activated when a driver pushes the hazard light button or switch. These lights alert other drivers to an emergency in which you may be in or that your car is parked on the side of the road. All turn signal lights switch on when you start your emergency flasher.

There are ***ventilation controls*** in a car. The heating or cooling mode in the car is controlled by the driver's control panel. The blower either sends cold air from air conditioning or warm air is taken from engine cooling medium to car cabin through ventilation openings presented at the appropriate locations.

Each ***door panel*** has a ***door handle***. There can be several controls such as a ***power window switch*** and a ***door lock*** on door handles in modern cars.

Car windows that can be opened or closed with the help of buttons called ***power window controls***. Power window controls were first introduced in 1941 with Ford Motors. They were first used in Lincoln Custom and Packard Custom Super 180 cars. The power window control has replaced the traditional manual handle. The power window switches are usually easy-to-use and convenient knobs located on a door handle.

Door lock controls allow closing doors from inside to secure the passengers, especially children, and the vehicle itself. A ***door lock knob*** is usually situated on a door handle, too.

Exercise 8. Match the controls (1-6) to their functions (a-f).

1. turn signals	a. the instrument in a vehicle which shows how fast the vehicle is moving
2. fuel gauge	b. a machine on which you can play CDs
3. CD player	c. an automatic device causing a light to flash on and off rapidly
4. speedometer	d. a switch by which the windows are regulated
5. power window control	e. the flashing lights on a dashboard of a car that tell you it is going to turn left or right
6. flasher	f. an instrument that measures and gives a visual display of the amount, level, or contents of fuel

Exercise 9. Match the synonyms.

1. handwheel, driving wheel	a. instrument panel
2. handbrake, parking brake	b. klaxon
3. mechanical transmission	c. storage compartment
4. accelerator pedal	d. beverage holder
5. glove compartment	e. steering wheel
6. gauge	f. safety belt
7. dashboard	g. gear shift, gear shifter
8. horn	h. emergency brake
9. seat belt	i. manual transmission
10. cup holder	j. gas pedal
11. stick shift	k. gage

Exercise 10. Work in pairs. Read and translate the dialogue between a car buyer and a salesman. Act it out.

Salesman: Hello! How can I help you?

Buyer: Hello. I want to buy a car for my wife. We're having our 10th wedding anniversary next week.

S.: Great! Would you like a big one or a small one?

B.: Hmm… I think medium-size. We have three children and my wife take them to school, the nursery, the musical school, tutors, the swimming pool, sports clubs and so on.

S.: Okay. So, she spends a lot of time driving. And you need enough space for all your kids, don't you?

B.: Yeah, that's right.

S.: I think I know what car will be the right choice for you. This way, please. Have a look at this model! It's a Japanese innovation. This black car looks really stylish. And the interior design with red carpet and red front bucket seats is elegant, too.

B.: Bucket seats? What are they like?

S.: Well, they are a kind of individual seats! As you can see, they have rounded sides that partly support the body. They ensure a comfortable ride and maximum safety. Take a seat!

B.: Wow! It's deep and extremely comfortable! I'm sure my wife will like it very much!

S.: And there is a rear bench seat. Three children can fit on it pretty well.

B.: Well, the steering wheel has a convenient shape, too.

S.: Yeah, it's so called custom-shaped. It helps the driver's hands to relax while driving.

B.: What are all these controls on the steering wheel?

S.: These knobs are to adjust the audio system, heat, and air conditioning.

B.: Fine. My wife loves listening to music while driving. And where is a door lock knob?

S.: It's on a driver's door handle. This one can lock all the doors and there's a window switch next to it by which the windows are regulated. All the controls are really easy-to-use and convenient.

B.: And what about a gear shifter?

S.: This model has a new and improved shifter. So, it only requires a touch of the fingers.

B.: This model was definitely designed with ease and comfort in mind! Can I take a test drive?

S.: Yes, sure. By the way, the rearview mirror and seat belts adjust electronically.

Exercise 11. Search the Web for the pictures of the most important car interior parts mentioned in the texts. Make a presentation about them. As an option, you may describe your car's interior.

Exercise 12. Look through Unit 12 again. Make a list of the words and word combinations you consider to be the terms. Translate them into Russian.

Unit 13. CLASSIFICATION OF ENGINES BY TYPES OF USED FUEL BY NUMBER OF STROKES PER CYCLE AND TYPE OF COOLING

Exercise 1. Match the types of car engines (1-19) to their Russian equivalents (a-s).

1. internal combustion engine	a. двигатель с циклом Отто (цикл с воспламенением от искрового разряда)
2. petrol/gasoline engine	b. газотурбинный двигатель
3. diesel engine	c. бензиновый двигатель
4. gas turbine engine	d. четырёхтактный двигатель
5. Otto cycle engine	e. двухтактный двигатель
6. Diesel cycle engine	f. двигатель внутреннего сгорания
7. dual combustion/Trinkler cycle engine	g. двигатель с циклом Дизеля (цикл с воспламенением от сжатия)
8. four-stroke engine	h. дизельный двигатель, дизель
9. two-stroke engine	i. одноцилиндровый двигатель
10. evaporative cooling engine	j. нижнеклапанный двигатель (с боковым расположением клапанов); двигатель с L-образной головкой цилиндров
11. spark ignition engine	k. двигатель с циклом Тринклера (цикл со смешанным сгоранием)
12. compression ignition engine	l. двигатель с верхними клапанами
13. single-cylinder engine	m. двигатель с воздушным охлаждением
14. L-head engine	n. двигатель с принудительным зажиганием
15. I-head engine	o. двигатель с охлаждением испарением
16. F-head engine	p. двигатель с водяным охлаждением
17. T-head engine	q. двигатель с воспламенением от сжатия

18. air-cooled engine	r. нижнеклапанный двигатель (с двусторонним расположением клапанов)
19. water-cooled engine	s. двигатель со смешанным расположением клапанов; двигатель с F-образной головкой цилиндров

Exercise 2. Read and memorize the words and word combinations.

1. engine двигатель; мотор
2. burning горение, сгорание
3. fuel топливо; горючее
4. operation cycle цикл (выполнения) операции; рабочий цикл
5. stroke такт; ход
6. ignition воспламенение; зажигание
7. valve arrangement расположение клапанов
8. cooling system система охлаждения
9. hydrocarbon углеводород
10. air-petrol mixture топливовоздушная смесь
11. suction stroke впускной такт
12. piston поршень
13. compress сжимать(ся)
14. compression stroke такт сжатия
15. ignite поджигать(ся)
16. power stroke рабочий такт
17. exhaust gases продукты сгорания; газы выпускные
18. exhaust stroke выпускной такт
19. spark plug свеча зажигания
20. fuel injection pump насос для впрыска топлива
21. diesel oil дизельное топливо
22. sustainable экологически устойчивый; не наносящий ущерба окружающей среде
23. clean diesel чистое дизельное топливо
24. biodiesel биодизель, биодизельное топливо
25. pollute загрязнять
26. viscosity вязкость
27. cetane number цетановое число
28. inject впрыскивать
29. catch fire воспламеняться
30. compressed air сжатый воздух
31. expand расширяться; увеличиваться в объёме
32. precombustion chamber предкамера, форкамера
33. glow plug свеча накаливания
34. durable надёжный, стойкий, долговечный, длительного пользования
35. maintenance техническое обслуживание и текущий ремонт
36. gas turbine engine газотурбинный двигатель
37. gas turbine powered automobiles автомобили, оснащённые газовыми турбинами
38. turbine-powered cars автомобили с приводом от газовых турбин
39. single charge единичный/разовый заряд
40. range запас хода; пробег без подзарядки
41. turboshaft engine турбовальный двигатель

42. piston engine поршневой двигатель
43. moving parts подвижные элементы; движущиеся детали
44. wear rate интенсивность изнашивания, скорость изнашивания; степень износа
45. working speed рабочая скорость
46. turbine blade лопатка турбины
47. dust пыль
48. fine sand мелкий песок
49. fitted смонтированный; установленный
50. out-of-order неисправный; испорченный, повреждённый
51. multifuel многотопливный, универсальный (двигатель)

Exercise 3. Read the international words and guess their meanings.

Classify, diesel, gas, cycle, cylinder, system, classification, type, category, gasoline, mixture, carburettor, cetane, compress, temperature, Fahrenheit, injector, final, turbine, efficiency, tractor, tank, passenger, experiment, serious, interest, hybrid, electric, super, Volvo, Jaguar, demonstrate, seconds, kilometer, battery, microturbine, bike, Rolls-Royce, model, theoretically. construction, practice, filter, modern, battery, corroded, injector, starter, alternator.

Exercise 4. Read and translate Text 1.

Text 1. Classification of Car Engines by Types of Used Fuel

Sources: *https://www.theengineerspost.com/types-of-engines/, https://en.wikipedia.org/wiki/Gas_turbine#In_surface_vehicles*

The engine of a car or other vehicle is the part that produces the power which makes the vehicle move. Engines can be classified according to the types of fuel used (petrol, diesel, gas engines), the cycle of operation (Otto cycle, Diesel cycle, Trinkler cycle /the dual combustion cycle engines), a number of strokes per cycle (four-stroke, two-stroke engines), the type of ignition (spark ignition, compression ignition engines), a number of cylinders (single-cylinder, two-cylinder, three-cylinder, four-cylinder, six-cylinder, eight-cylinder, twelve-cylinder, sixteen-cylinder engines), a valve arrangement (L-head, I-head, F-head, T-head engines), and a cooling system (air-cooled, water-cooled, evaporation cooling engines).

Let's consider the classification of engines according to the type of fuel used. They are classified into three categories: petrol or gasoline engines, diesel engines and gas turbine engines.

The ***petrol engine*** is also called a gasoline engine. It uses petrol for its running. Petrol or gasoline is a hydrocarbon, made up of hydrogen and carbon compounds. Air-petrol mixture is sucked into the cylinder during the suction stroke of the piston. The correct air-petrol mixture is obtained from the carburettor.

The mixture is compressed during the compression stroke, ignited during the power stroke and the exhaust gases pushed out during the exhaust stroke. A spark plug is fitted at the top of the cylinder which gives a spark to ignite the mixture. Most gasoline engines use a fuel injection pump. Petrol engines are mainly used in passenger cars.

In ***diesel engines***, diesel oil is used for its running. There also are more sustainable fuel options like clean diesel and biodiesel which pollute the air less than diesel and provide better fuel economy. Diesel oil is light, with low viscosity and high cetane number. Diesel engines don't have any spark plugs. The fuel is ignited by hot, compressed air. In the diesel engine, only air is sucked into the cylinder during the suction stroke and compressed to high pressure, the compression ratio is as high as 22:1. Its temperature also rises

by about 1,000°F.

The diesel oil is injected by an injector at the end of the compression stroke which catches fire and burns due to the high temperature of the compressed air. The burnt gases expand pushing the piston down during the power stroke and finally, the gases are pushed out during the exhaust stroke. Also, there are diesel engines which have precombustion chambers or glow plugs that heat up the air. The efficiency is higher in this case.

Buses, trucks, tractors and tanks usually have diesel engines. Also, they can be found in some passenger cars. In general, diesel engines are considered to be more durable and need less maintenance.

As to a ***gas turbine engine***, a number of experiments have been conducted with gas turbine powered automobiles mainly by Chrysler. The first serious investigation was in 1946. Turbine-powered cars were built in different countries (JET 1, SOCEMA-Grégoire, GM Firebird I, the race car Rover-BRM, the sports car Howmet TX, etc.) More recently, there has been some interest in the use of gas turbine engines for hybrid electric cars (Volvo ECC, GM EV-1). The electrically powered supercar Jaguar C-X75 was first demonstrated in 2010. It has a top speed of 328 km/h and can go from 0 to 100 km/h in 3.4 seconds. It travels 109 km on a single charge of the batteries, and uses a pair of Bladon Micro Gas Turbines to recharge the batteries extending the range to 900 km.

As to other types of vehicles, some hybrid buses powered by microturbines are now operated in several countries. Also, there are some turbine-powered motorcycles (MTT Turbine Superbike, Rolls-Royce Allison model 250 turboshaft engine). The gas turbine engines have been used in tanks (T-80, M1 Abrams, etc.), too. But there are some disadvantages. A turbine is theoretically more reliable and easier to maintain than a piston engine since it has a simpler construction with fewer moving parts. But in practice, turbine parts experience a higher wear rate due to their higher working speeds. Moreover, the turbine blades are highly sensitive to dust and fine sand. The air filters have to be fitted and changed several times daily. An improperly fitted or an out-of-order filter can damage the engine. So, tanks mostly use modern diesel engines. Gas turbines are usually multifuel engines.

Exercise 5. Answer the questions.

1. What is a car engine?
2. What are the types of car engines according to the types of fuel used?
3. How can car engines be classified according to the cycle of operation?
4. What is the car engines classification according to a number of strokes per cycle?
5. What types of car engines according to the type of ignition can you name?
6. What types of car engines according to a number of cylinders do you know?
7. What are the names of car engines according to the valve arrangement?
8. How are the engines called according to the cooling system used in a vehicle?
9. What fuel does a petrol engine use?
10. What is the principle of operation of the petrol engine?
11. What fuel is used for running a diesel engine?
12. How does the diesel engine function?
13. Which type of engine is regarded as more durable?
14. What company has been performed a number of experiments with gas turbine powered vehicles?
15. What turbine-powered cars built in the middle of the 20th century can you name?
16. What is the recent idea of gas turbine engines' usage?
17. What other types of modern vehicles are turbine-powered?
18. What are the main disadvantages of the gas turbine engines used in tanks?

Exercise 6. Match the terms (1-17) to their definitions (a-q).

1. diesel engine	*a.* the stage of the cycle of an internal-combustion engine in which the piston is driven outward by the expansion of gases
2. hydrocarbon	*b.* the state of being thick, sticky, and semi-fluid in consistency, due to internal friction
3. power stroke	*c.* is an internal combustion engine in which oil is burnt by very hot air. These engines are used in buses and trucks, and in some trains and cars.
4. cetane number	*d.* air that is at more than atmospheric pressure
5. viscosity	*e.* a turbine driven by expanding hot gases produced by burning fuel
6. internal combustion engine	*f.* a chemical compound that is a mixture of hydrogen and carbon which are the chief components of petroleum and natural gas
7. gas turbine	*g.* the nozzle and valve through which fuel is sprayed into a combustion chamber in an internal-combustion engine
8. centrifugal force	*h.* a quantity indicating the ignition properties of diesel fuel relative to cetane as a standard
9. fuel injector	*i.* the force that makes objects move outwards when they are spinning around something or travelling in a curve
10. biodiesel	*j.* able to withstand wear, pressure, or damage; hard-wearing
11. pollute	*k.* an engine in which power is derived from cylinders and pistons rather than a turbine
12. maintenance	*l.* an engine that creates its energy by burning fuel inside itself. Most cars have internal combustion engines
13. durable	*m.* a heavy armoured fighting vehicle carrying guns and moving on a continuous articulated metal track
14. piston engine	*n.* fuel made from natural sources such as plant oils, that can be used in diesel engines
15. tank	*o.* a device for filtering particles from the air passing through it, especially one protecting the air inlet of an internal-combustion engine
16. compressed air	*p.* contaminate (water, the air, etc.) with harmful or poisonous substances
17. air filter	*q.* the process of keeping something in good condition

Exercise 7. Work in pairs. Read and translate the dialogue between a new mechanic and an experienced mechanic. Act it out.

Information source: https://www.epermittest.com/drivers-education/engine-transmission

Mechanic 1: I can't understand what's wrong with this engine. I checked it and it seems to be fine. But the car owner said the car didn't start.

Mechanic 2: If the car doesn't start, most people think that something awful has happened to the engine. But this is not always the case. For example, it could be caused by a faulty battery or corroded battery terminals.

M. 1: I thought about it. I've checked those. They are all right.

M. 2: Okay. What about a fuel pump? It could be failed.

M. 1: No, it's also fine. And I've checked the fuel injectors as well. I thought they could be dirty. They aren't new but still in good condition.

M. 2: Well, then it could be a faulty starter motor.

M. 1: Really? I'll have a look at it. It's okay.

M. 2: Hmm… one more option is a faulty alternator which is responsible for re-charging the battery.

M. 1: It can't be the alternator because it looks pretty new. Most probably, it has been replaced recently.

M. 2: Then, I'm certain it's a broken ignition switch.

M. 1: Yeah, it could be that. I haven't thought about it. Oh, look. It's malfunctioning. Thanks a lot for your help!

Exercise 8. Read and memorize the words and word combinations from Text 2.

1. four-stroke engine четырёхтактный двигатель
2. two-stroke engine двухтактный двигатель
3. piston stroke ход поршня
4. four-piston stroke четырёхтактный цикл
5. suction, intake stroke впуск
6. compression stroke сжатие
7. power stroke рабочий ход, расширение
8. exhaust stroke выпуск
9. revolution поворот
10. crankshaft коленчатый вал
11. intake valve впускной клапан; всасывающий клапан
12. air-fuel mixture топливно-воздушная смесь
13. gasket прокладка
14. cylinder head головка цилиндра; головка блока цилиндров
15. combustion pressure давление сгорания
16. exhaust valve выпускной клапан
17. power stroke рабочий ход (двигателя)
18. two-piston strokeдвухтактный цикл
19. horsepower мощность в л.с.; лошадиная сила, л.с.
20. intake stroke впускной такт
21. spark plug свеча зажигания
22. combustion chamber камера сгорания
23. cooling method метод охлаждения
24. air-cooled engine двигатель с воздушным охлаждением
25. water-cooled engine двигатель с водяным охлаждением
26. evaporative cooling engine двигатель с охлаждением испарением
27. cylinder barrel корпус цилиндра (двигателя)
28. fin пластина, заусенец, ребро для охлаждения
29. radiating surface поверхность, обладающая излучением
30. rate of cooling темп охлаждения, скорость охлаждения
31. shroud футляр, кожух
32. heavy-duty vehicle автомобиль для тяжёлых условий эксплуатации
33. cooling medium охлаждающий агент, охлаждающая среда, хладагент
34. water jacket водяная рубашка
35. valve seat гнездо клапана
36. valve stem стержень клапана; шток клапана

Exercise 9. Read the international words and guess their meanings.

Classification, cycle, automobile, operation, revolution, motorcycle, scooter, method, category, practical, metal, cylinder, problem, motor, antifreeze, circulate, block, radiator, temperature, result, start, thermostat, correct, filter, mixture, compression, gas, vacuum.

Exercise 10. Read and translate Text 2.

Text 2. Classification of Car Engines by Number of Strokes per Cycle and Type of Cooling

Source: https://www.theengineerspost.com/types-of-engines/

According to the number of strokes per cycle, the automobile engines are classified as four-stroke engines and two-stroke engines.

The ***four-stroke engine*** completes a cycle of operations during the four-piston strokes, namely suction, compression, power and exhaust. These four strokes require two revolutions of the crankshaft. Thus, during every two revolutions of the crankshaft, there is only one power stroke of the piston.

The first stroke is called suction or intake stroke. During this stroke fuel and air come into the cylinder through the intake valve. The piston inside the cylinder moves down so that there is some space for the air-fuel mixture. After the valve closes, the piston moves up again. Then the second stroke called compression stroke starts. The piston, which moves upwards, compresses the fuel and air. The the gasket between the cylinder head and the cylinders and the valves on the cylinder head have the combustion pressure. Then the third stroke called power stroke begins. The mixture is ignited with heat or a spark to create a force that pushes the piston down and powers the engine. The fourth stroke is called the exhaust stroke because the exhaust valve opens to let the remaining gases go out.

The ***two-stroke engine*** completes a cycle of operations during the two-piston strokes. These two strokes require one revolution of the crankshaft. Thus, during every one revolution of the crankshaft, there is one power stroke of the piston. Therefore, a two-stroke engine produces twice as much horsepower as a four-stroke engine of the same size, running at the same speed.

In the two-stroke engine, the intake and compression strokes, and the power and exhaust strokes are combined.

At the beginning of the cycle, the piston goes down to create a vacuum. The fuel, air, and oil mixture are sucked through the inlet. To compress the mixture, the piston moves upwards. And the fuel mixture is ignited with a spark plug. It results in explosion that pushes the piston back down and forces exhaust out of the combustion chamber. It's the end of the cycle.

Two-stroke engines are used in motorcycles and scooters. Four-stroke engines are used in cars, trucks and buses.

According to the type of cooling method, the automobile engines are classified mainly into two categories: air-cooled engines and water-cooled engines. There are also evaporative cooling engines but they are not practically used.

Air-cooled engines are used in motorcycles and scooters. In air-cooled engines, the cylinder barrels are usually separate and are equipped with metal fins which give a large radiating surface to increase the rate of cooling.

Many air-cooled engines are equipped with metal shrouds which direct the airflow around the cylinders for improved cooling. Since these engines do not use water, the problem of cold weather maintenance is eliminated.

Water-cooled engines are used in buses, trucks, cars, and other four-wheeled, heavy-duty motor vehicles. These engines use water, with an antifreeze compound added to serve as the cooling medium.

The water is circulated through water jackets around each of the combustion chambers, cylinders, valve seats and valve stems. After passing through the engine jackets in the block and cylinder head, the water is passed through the radiator, where it is cooled by air drawn through the radiator.

Exercise 11. Answer the questions.

1. What are the types of engines according to the number of strokes per cycle?
2. How many strokes does a complete cycle of a four-stroke engine have?
3. What are these four strokes?
4. How many revolutions of a crankshaft do these four strokes require?
5. How many strokes does a two-stroke engine need to complete a cycle?
6. How many revolutions of the crankshaft do these two strokes require?
7. Why is the two-stroke engine more productive?
8. What types of vehicles have two-stroke engines?
9. What types of vehicles use four-stroke engines?
10. What are the types of engines according to the type of cooling method?
11. What types of vehicles have air-cooled engines?
12. What is the principle of operation of an air-cooled engine?
13. What types of vehicles use water-cooled engines?
14. How does the water-cooled engine function?

Exercise 12. Match the terms (1-8) to their definitions (a-h).

1. crankshaft	*a.* (about an internal-combustion engine) having its power cycle completed in one up-and-down movement of the piston
2. piston	*b.* (about an internal-combustion engine) having a cycle of four strokes – intake, compression, combustion, and exhaust
3. two-stroke	*c.* a disc or short cylinder fitting closely within a tube in which it moves up and down against a liquid or gas, used in an internal-combustion engine to derive motion, or in a pump to impart motion
4. four-stroke	*d.* a casing containing water placed around something to protect it from extremes of temperature
5. antifreeze	*e.* the end cover of a cylinder in an internal-combustion engine, against which the piston compresses the cylinder's contents
6. water jacket	*f.* the main shaft of an internal combustion engine
7. cylinder head	*g.* an enclosed space in which combustion takes place, especially in an engine
8. combustion chamber	*h.* a liquid which is added to water to stop it freezing; it is used in car radiators in cold weather

Exercise 13. Work in pairs. Read and translate the dialogue between two mechanics. Act it out.

Information source: https://www.epermittest.com/drivers-education/engine-transmission

Mechanic 1: Well, we'll need to repair this car today. The car owner said that the engine temperature gauge was red. He saw vapor billowing from the engine compartment and there was a nasty smell coming through the air vents.

Mechanic 2: It sounds like the engine is overheating. This is usually the result of low coolant levels. Let's start with them.

M. 1: The levels appear to be fine. The overheating engine may also be caused by a broken thermostat. I'll check it. It's fine. What about a cooling fan in the radiator? Is it broken?

M. 2: No, it isn't. And the radiator hoses aren't damaged.

M. 1: Let's have a look at a radiator cap. If it is broken or fitted incorrectly, it may cause overheating as well.

M. 2: It is all right.
M. 1: Hmm… then it could be a blockage in the air filter.
M. 2: Yeah, you are right. Look, it's clogged. I'll remove and replace it.

Exercise 14. Look through Unit 13 again. Make a list of the words and word combinations you consider to be the terms. Translate them into Russian.

Unit 14. CLASSIFICATION OF ENGINES BY NUMBER AND ARRANGEMENT OF CYLINDERS

Exercise 1. Read and memorize the words and word combinations.

1. truck грузовой автомобиль, грузовик
2. industrial installation промышленная установка, промышленное предприятие
3. front drive/front-wheel drive передача на передние ведущие колёса; передний привод
4. c.c. (cubic centimetre) кубический сантиметр
5. unbalanced force неуравновешенная сила
6. overcoming преодоление
7. friction resistance сопротивление трения, фрикционное сопротивление
8. torque distribution распределение крутящего момента
9. uneven неровный; неравномерный; скачкообразный
10. counterweight противовес (коленчатого вала)
11. flywheel маховое колесо, маховик
12. momentum количество движения, импульс; толчок; движущая сила
13. steady равномерный; устойчивый
14. fluctuations флуктуации, колебания, отклонения
15. in-line расположенный в линию
16. V-type V-образный, конусообразный
17. opposed cylinders цилиндры, расположенные в одной плоскости по обе стороны коленчатого вала, оппозитные цилиндры
18. crankcase картер двигателя
19. precompression предварительное сжатие
20. smooth гладкий; плавный
21. universally везде, всюду, повсюду
22. crank колено
23. crankpin шатунная шейка коленчатого вала
24. connecting rod шатун
25. W-type W-образный
26. rattling дребезжание; грохочущий
27. squealing свист, скрежет
28. ticking издавать щёлкающий звук, тикающий
29. whining воющий
30. engine oil warning light предупредительный световой сигнал об уровне машинного масла

Exercise 2. Read the international words and guess their meanings.

Cylinder, automobile, motorcycle, scooter, jeeps, American, passenger, industrial, balance, impulse, resistance, distribution, vibration, mechanical, vertical, differential, transmission, uniform, Ferrari, strange, really, serious, problem, result, fix, air conditioning, compressor, reservoir, phone, indication, temperature, transmission, system.

Exercise 3. Read and translate Text 1. Match Parts 1-6 to the titles (a-f).

Part 1	a. Three-Cylinder Engine
Part 2	b. Six- and Eight-Cylinder Engines
Part 3	c. Twelve- and Sixteen-Cylinder Engines
Part 4	d. Two-Cylinder Engine
Part 5	e. Four-Cylinder Engine
Part 6	f. Single Cylinder Engine

Text 1. Classification of Car Engines by Number and Arrangement of Cylinders

Information source: https://www.theengineerspost.com/types-of-engines/

The automobile engines may have one, two, three four, six, eight, twelve and sixteen cylinders. One cylinder engine is used in scooters, motorcycles. The two-cylinder engine is used in tractors. Four and six-cylinder engines are used in cars, jeeps, buses and trucks. American passenger cars have eight-cylinder engines. Twelve and sixteen-cylinder engines are also used in some passenger cars, buses, trucks, industrial installations. The three-cylinder engine is also used in a foreign front-drive automobile.

Part 1

These types of engines are used generally for light vehicles like scooters and motorcycles. Maximum size of the single cylinder engine is restricted to about 250-300 c.c. Higher engine size will require heavy engines due to the higher unbalance forces in single cylinder engine.

In one cylinder there is one power impulse in two revolutions of the crankshaft. Thus, out of the four strokes of the pistons, the power is delivered in one stroke and in the remaining strokes of the pistons the power is consumed in overcoming the friction resistance of the moving parts. The torque distribution during a cycle is uneven resulting in rough working and vibrations.

The one-cylinder engine does not have mechanical balance. However, the engine is balanced to some extent by using the counterweight attached to the crankshaft, and also by using a flywheel so heavy that its momentum produces a comparatively steady movement. The fluctuations in the engine speed cause vibration, even in the best designs of one-cylinder engines. Therefore one-cylinder engines are undesirable for use in motor vehicles.

Part 2

These types of engines are used mostly in tractors. They are also used in small German automobiles. The arrangement of the cylinders in the two-cylinder engines may be of three types – in-line vertical type, V-type and opposed type.

Part 3

The three-cylinder engine is used on a front-drive car, in which the differential is located between the engine and the transmission. The three cylinders are placed in line. This is a two-stroke cycle engine. The crankcase in this engine serves as an intake and precompression chamber. The crankcase is divided into three separate compartments, one for each cylinder.

Part 4

Four-cylinder engines are mostly used for ordinary cars. The torque obtained is much more uniform as compared to the two-cylinder engine because two working stroke per revolution is obtained. The cylinders of a four-cylinder engine are arranged in the following types – in-line vertical type, V-type and opposed type.

Part 5

Six- and eight-cylinder engines give much smoother torque and higher horsepower. The cylinders of these engines are also arranged in the three ways – in line, V-type and

opposed type. In line six-cylinder engines and V-type eight-cylinder engines are almost universally in use. The angle between the cylinder rows in V-type eight-cylinder engines is kept usually 90°. V-type six-cylinder engines have two three-cylinder rows that are set at an angle to each other. The crankshaft has only three cranks, with connecting rods from opposing cylinders in the two rows being attached to the same crankpin. Each crankpin has two connecting rods attached to it.

The V-type eight-cylinder engine has two four-cylinder rows that are set at an angle to each other. The crankshafts have four cranks with connecting rods from opposing cylinders in the two rows being attached to a single crankpin. Thus, two rods are attached to each crankpin, and two pistons work to each crankpin.

Part 6

The arrangement of cylinders in twelve- and sixteen-cylinder engines may be of the following types – V-type, W-type and X-type. V-type has two rows of cylinders. W-type has three rows of cylinders. X-type has four rows of cylinders.

The twelve- and sixteen-cylinder engines have been used in cars, buses, trucks and industrial installations. The only passenger car now being made with a twelve-cylinder engine is the Ferrari.

Exercise 4. Match the terms (1-4) to their definitions (a-e).

1. flywheel	*a.* a cylinder-shaped part of an engine in which a piston moves backwards and forwards
2. crankpin	*b.* a light two-wheeled open motor vehicle on which the driver sits over an enclosed engine with his legs together and his feet resting on a floorboard
3. motor scooter	*c.* a rod connecting two moving parts in a mechanism, especially that between the piston and the crankpin in an engine or pump
4. connecting rod	*d.* a heavy wheel that is part of some engines; it regulates the engine's rotation, making it operate at a steady speed
5. cylinder	*e.* a pin by which a connecting rod is attached to a crank

Exercise 5. Work in pairs. Read and translate the dialogue between a mechanic and a customer. Act it out.

Information source: https://www.epermittest.com/drivers-education/engine-transmission

Mechanic: Hello! What's wrong with your car?

Customer: Hi! I can hear a strange noise coming from my car's engine every time I drive it. It appeared two days ago.

M.: Okay. What kind of noise is it?

C.: Oh, I don't know how to describe it.

M.: Well, I'll help you. Do you hear rattling, squealing, ticking or whining?

C.: Let me think. I'm sure it's more like rattling.

M.: And does the engine oil warning light come on while you hear the rattling sound?

C.: Yes, it does. Is this a really serious problem?

M.: Yes, it is. Most probably, the moving parts in your engine are dangerously underlubricated as a result of low oil levels. It definitely has to be checked and fixed, if needed.

C.: Do you mean rattling sounds may also be caused by other malfunctions?

M.: Exactly! It can be caused by poor belt tension, a problem with the air conditioning compressor or a loose reservoir cap. I need to check all that.

C.: Okay. Here is my phone number. Call me, please, when the car is ready.

Exercise 6. Work in pairs. Read more information about strange noises that may come from a car engine. Make more dialogues similar to the dialogue in Exercise 5. Act them out.

Information source: https://www.epermittest.com/drivers-education/engine-transmission

1. Squealing or screeching

A squealing or screeching sound usually means a problem with one of the engine's belts. The sound may be an indication that the belt is slipping, damaged or corroded. If the high-pitched sound is accompanied by a sudden rise in engine temperature, it may be that the water pump has failed and will need to be replaced. If you're lucky, it could just be that one of the belts needs tightening.

2. Clicking or ticking

A clicking or ticking sound may mean that the valve train (connecting the camshaft to the cylinder valves) has shifted slightly out of place and needs to be adjusted. Moderately low motor oil can also cause clicking or ticking sounds anywhere within the engine, so this is the first thing that should be checked.

3. Whining

A whining noise may be the result of wear to your transmission. Problems with the power steering system can also cause whining sounds. It may be that your power steering fluid is running low.

Exercise 7. Search the Web for the types of car engines. Make a presentation about them. As an option, you may describe your car's engine.

Exercise 8. Look through Unit 14 again. Make a list of the words and word combinations you consider to be the terms. Translate them into Russian.

Unit 15. IGNITION SYSTEM: TYPES, PARTS AND PRINCIPLE OF OPERATION

Exercise 1. Read and memorize the words and word combinations.

1. ignition system система зажигания
2. spark-ignition engine двигатель с искровым зажиганием
3. air-fuel mixture топливно-воздушная смесь; горючая смесь
4. compression stroke такт сжатия, ход сжатия (в двигателе)
5. plug свеча зажигания
6. spark искра
7. battery ignition батарейное зажигание
8. coil ignition зажигание с катушкой индуктивности
9. ignition/induction coil бобина; катушка зажигания
10. magneto ignition индукторное зажигание; зажигание от магнето
11. electronic ignition электронное зажигание
12. battery батарея системы зажигания
13. ignition switch замок зажигания
14. ballast resistor нагрузочный резистор
15. contact breaker прерыватель контакта
16. capacitor конденсатор
17. magneto магнето; индуктор
18. high voltage высокое напряжение

19. running работа; эксплуатация
20. distributor распределитель системы зажигания
21. unit блок
22. external voltage внешнее напряжение; ускоряющее напряжение
23. cam кулачок прерывателя
24. higher mileage большой пробег в милях; большой срок службы
25. reliability безотказность; надёжность; прочность; безопасность
26. electronic circuit электронная схема
27. timing синхронизация по времени
28. contact breaker прерыватель контакта
29. armature якорь
30. reduced emission сниженные выбросы
31. lean mixture бедная горючая смесь
32. combustion chamber камера сгорания (двигателя)
33. continuous cycle непрерывный цикл
34. ignition source источник зажигания
35. toy gun игрушечный пистолет
36. breaker points контакты прерывателя
37. pickup coil воспринимающая катушка
38. electronic ignition control module электронный блок управления системой зажигания

Exercise 2. Read the international words and guess their meanings.

Compressed, device, cylinder, electrical, system, battery, combination, generator, component, type, system, create, energy, voltage, generate, electricity, ballast, resistor, contact, limitation, transistor, control, sensor, mixture, provide, economy, emission, module, dynamo, metal, electrode, electrical, instruction, programmed, signal, stops, function, terminals, distributor, individual, correct, rotor, pass, ionize.

Exercise 3. Read and translate Text 1.

Text 1. Ignition System

Information sources: https://www.theengineerspost.com/types-of-ignition-system/, https://engineeringlearn.com/types-of-ignition-system/, https://www.engineeringchoice.com/what-is-ignition-system/, https://themechanicalengineering.com/electronic-ignition-system/, https://learnmechanical.com/electronic-ignition-system/

The ignition system is one of the most important systems used in the internal combustion engines. The spark-ignition engine requires some device to ignite the compressed air-fuel mixture. The ignition takes place inside the cylinder at the end of the compression stroke; the ignition system serves this purpose. It is a part of the electrical system which carries the electrical current to a current plug. It gives the spark to ignite the air-fuel mixture at the correct time.

There are three main types of ignition system: a battery ignition system or a coil ignition system, a magneto ignition system and an electronic ignition system.

The ***battery ignition system*** is widely used in automobiles in order to produce spark with the help of a spark plug and a battery. It was mostly found in 4-wheelers but now is also used in two-wheelers which attain current from a 6-12-volt battery present in the ignition coil. The battery ignition system consists of a battery, an ignition switch, an ignition coil, a ballast resistor, a contact breaker, a distributor, a capacitor and a spark plug. Even

today the battery ignition system is used in most cars, light trucks, buses, etc. because it has high accuracy and high efficiency.

The magneto serves as the main component in the ***magneto type ignition system*** which is used for creating the energy at high voltage. This high voltage is used for generating electricity which is then used for running vehicles. This system is made by the combination of a distributor and a generator in one single unit. This is what makes it different from a conventional distributor which creates spark energy without any external voltage. The components of this ignition system are a magneto, a distributor, a capacitor, a cam, a contact breaker and an ignition switch. This type of ignition system is used in small spark-ignition engines, for example, scooters, motorcycles and small motorboat engines.

There are certain limitations in the abovementioned systems. So, the need for higher mileage, reduced emissions and greater reliability has led to the development of the electronic ignition system.

The ***electronic ignition system*** is the type of ignition system that uses electronic circuit. It is completely controlled electronically and is powered from a battery. It works under the engine for providing the spark to a spark plug timing. It is different from the other ignition system in the contact breaker section. Instead of the contact breaker, an armature is placed. To burn the lean mixture in the combustion chamber electronic ignition system produces a stronger spark that is really great as compared to the battery and magneto ignition system. Better spark provides better economy and lower emission.

In an internal combustion engine, combustion is a continuous cycle and occurs thousands of times in a minute, so an effective and accurate ignition source is required. The idea of spark ignition came from an electric toy gun that used an electric spark to ignite a mixture of hydrogen and air to shoot a cork. This system still has a distributor, but the breaker points have been replaced with a pickup coil, and there's an electronic ignition control module. The components of an electronic ignition system include a battery, a distributor, a capacitor, an ignition control module, an armature, an ignition coil and a spark plug. The electronic ignition system has a lot of applications in the 21st century. It is mostly used in modern and hyper cars. You can find it in Audi, Mahindra XUV, KTM bikes, Ducati, etc. It is also applied in aircraft engines.

Exercise 4. Match the questions (1-7) about Text 1 to the appropriate answers (a-g).

1. What is an ignition system?	a. It has a battery, an ignition switch, an ignition coil, a ballast resistor, a contact breaker, a distributor, a capacitor and a spark plug.
2. What is the function of the ignition system?	b. They are a magneto, a distributor, a capacitor, a cam, a contact breaker and an ignition switch.
3. What are the three types of the ignition system?	c. It's a system that generates an electric spark to ignite the fuel-air mixture; the burning of this mixture in the cylinders produces the motive force.
4. What does the battery ignition system consist of?	d. This system includes a battery, a distributor, a capacitor, an ignition control module, an armature, an ignition coil and a spark plug.
5. What are the components of the magneto ignition system?	e. The purpose of the ignition system is to create an electric spark in the engine combustion chamber, at exactly the right time, which will ignite the mixture of petrol and air.
6. What is the electronic ignition system?	f. There are three basic types of ignition system – battery ignition system, magneto ignition system and electronic ignition system.

7. What is the electronic ignition system composed of?	g. It's a type of the ignition system that uses an electronic circuit. It has an armature instead of the contact breaker. It provides better economy and lower emission.

Exercise 5. Match the parts of the electronic ignition system (1-7) to their Russian equivalents (a-g).

1. an electronic control module	a. распределитель
2. a battery	b. замок зажигания
3. a distributor	c. электронный блок управления
4. a spark plug	d. катушка зажигания
5. an ignition switch	e. якорь
6. an ignition coil	f. батарея
7. an armature	g. свеча зажигания

Exercise 6. Read and memorize the words and word combinations.

1. rechargeable перезаряжаемый
2. lead-acid battery свинцово-кислотная батарея
3. dynamo динамомашина; генератор постоянного тока
4. grounded/earthed заземлённый
5. positive pole положительный полюс
6. primary winding первичная обмотка
7. switch on включать
8. switch off выключать
9. pickup coil измерительная/воспринимающая катушка
10. flow поток; струиться, течь
11. current ток
12. primary circuit первичная цепь
13. timer circuit хронирующая цепь; схема синхронизации
14. voltage напряжение
15. contact breaker points контакты прерывателя
16. anchor якорь
17. armature tooth зубец якоря
18. ignition energy энергия искры зажигания
19. electric spark искровой разряд
20. secondary winding вторичная обмотка
21. external terminal внешний терминал/вывод
22. ignition pulse импульс зажигания
23. rotor бегунок (распределителя зажигания)
24. circumference периферия
25. ignition harness проводка системы зажигания
26. camshaft распределительный вал, кулачковый вал
27. live high voltage wires провода под высоким напряжением
28. potential difference разность электрических потенциалов
29. ionize ионизировать
30. combustible/air-fuel mixture горючая/топливная смесь

Exercise 7. Read and translate Text 2.

Text 2. Construction of Electronic Ignition Systems

Information sources: https://themechanicalengineering.com/electronic-ignition-system/, https://www.engineeringchoice.com/what-is-ignition-system/, https://www.theengineerspost.com/electronic-ignition-system/

The electronic ignition system consists of following main parts: a battery, an ignition switch, an electronic control module, an armature, an ignition coil, an ignition distributor and a spark plug.

A rechargeable lead-acid ***battery*** is used to provide electrical energy for ignition in the cylinder. This battery is charged by a dynamo powered by the engine.

One end of the battery is grounded and the other end (positive pole) is connected to the primary winding of the ignition coil via the ***ignition switch***. This switch (key) is used to switch the ignition system on and off.

The ***electronic control module*** is the brain of an electronic ignition system. All the instructions are already programmed in this module and it monitors the timing and intensity of the spark. It detects the signal generated by the pickup coil and stops the flow of current from the primary circuit. The timer circuit in the ignition module is switched on and the current flows back into the circuit when the voltage is not generated.

Contact breaker points of the battery ignition system are replaced by an ***armature*** or anchor. When the armature tooth comes in front of the pick-up coil, a voltage signal is generated.

The ***ignition coil*** is the source of the ignition energy. Its function is to increase the low voltage to high voltage to induce an electric spark in the spark plug. An ignition coil consists of the primary and secondary windings. The primary winding consists of 200 to 300 turns, both ends being connected to the external terminals. The secondary winding consists of 21,000 turns with one end connected to the high voltage wire leading to the distributor and the other end connected to the primary coil.

A ***distributor*** helps to distribute the ignition pulses to individual spark plugs in the correct order in relation to the ignition order. It consists of the rotor in the middle and the metal electrode on the circumference. These metal electrodes are directly connected to the spark plugs and are also known as the ignition harness. The secondary winding of the ignition coil is connected to the rotor of this distributor, which is driven by the camshaft. As the rotor rotates, it passes the high voltage current to the ignition harness, which then carries those high voltage currents to the spark plugs.

A ***spark plug*** is the output part of the entire ignition system that is responsible for generating sparks in the engine cylinder. It consists of 2 electrodes, one of which is attached to the live high voltage wires and the other is earthed. The potential difference between these electrodes ionizes the gap between them and thus a spark is generated which ignites the combustible mixture.

Exercise 8. Answer the questions about Text 2.

1. What are the parts of an electronic ignition system?
2. What kind of battery is used in the electronic ignition system?
3. Why is the battery regarded as the powerhouse of the whole system?
4. Where is an ignition switch located?
5. What part is used to switch the ignition system on and off?
6. Why is an electronic control module regarded as the brain of the system?
7. What is the function of the electronic control module?
8. What is the role of an armature?

9. What function does an ignition coil perform?
10. What does the ignition coil consist of?
11. What is the purpose of a distributor?
12. What does the distributor include?
13. What is the principle of operation of the distributor?
14. What is a spark plug responsible for?
15. What is the spark plug composed of?

Exercise 9. Complete the sentences about the electronic ignition system with the words given in the box.

Properly, plugs, acts, device, air, ignition, battery

1. The ignition system creates an electric spark in the engine combustion chamber at exactly the right time to ignite the mixture of petrol and … . 2. We recognize three basic types of … system: a battery ignition system, a magneto ignition system and an electronic ignition system. 3. The ignition coil … as a transformer. 4. Each spark plug must fire at exactly the right time for the engine to run … . 5. The … and ignition coil provide the power; the distributor determines where that power goes and when. 6. A spark plug is a … in the engine of a motor vehicle, which produces electric sparks to make the petrol burn. 7. Worn spark … or wires can significantly reduce the operating life of the coil.

Exercise 10. Read and translate the dialogue between an intern and a car mechanic. Act it out with a partner.

Intern: I've read that the electronic ignition system is mostly used in modern vehicles and hyper cars.

Mechanic: Yeah, that's right. It's applied in Audi, Mahindra XUV, KTM bikes, Ducati and the like. The main disadvantage of this system is that it's very expensive. So, on the one hand, not everyone can afford the vehicles having an electronic ignition system. On the other hand, the vehicles having this system have a long life and extremely reliable.

I.: Do you mean it increases the efficiency of the engine?

M.: Yeah, and it's also fuel-efficient. Besides, it has no moving parts because it's controlled by the ECU.

I.: ECU? What does ECU stand for?

M.: Well, it's electronic control unit.

I.: Oh, I see! And what are the advantages of this system compared to other types of ignition systems?

M.: You know, it's more accurate than the magneto system. And it's a low maintenance system in comparison with battery ignition and magneto ignition systems. And last but not least… the emission is less!

I.: So, it's environmentally friendly! Sounds cool!

Exercise 11. Read and translate the dialogue between a client and a car mechanic. Act it out with a partner.

Client: Hello! I would like you to have a look at my car.

Mechanic: Hi! What's wrong with your car?

C.: I tried to start it but nothing happened. First, I thought I had run out of gas but the fuel gauge showed the tank was half full. Then, I checked the charge of the battery. It's also good.

M.: Okay. When did you have your plugs checked?

C.: A couple of weeks ago. They were fine.

M.: Good. When you turn the key, do the lights work?

C.: Yes, they do.

M.: And what about the engine? Does it make a clicking noise?

C.: No, it doesn't. It's absolutely silent.

M.: I see. Most probably, the ignition switch has failed or there's a problem with the starter. I'll check them and replace, if needed.

C.: Great! Thanks!

Exercise 12. Look through Unit 15 again. Make a list of the words and word combinations you consider to be the terms. Translate them into Russian.

Unit 16. FUEL SYSTEM

Exercise 1. Read and memorize the words and word combinations.

1. fuel system топливная система
2. fuel injection system система впрыска топлива, инжекторная система подачи топлива
3. combustion chamber камера сгорания
4. fuel tank топливный бак
5. fuel vapor пары топлива
6. vent (вентиляционное) отверстие
7. fuel pump топливный насос
8. mounted установленный
9. gas tank бензобак, бак для бензина
10. plunger плунжер
11. fuel injector топливная форсунка; топливный инжектор
12. gunk загрязнение в виде отложений, осадка, ржавчины
13. throttle plate дроссельная заслонка
14. internal combustion engine двигатель внутреннего сгорания
15. fitted смонтированный; установленный; встроенный
16. carburetor jet жиклёр карбюратора
17. fuel injection system система впрыска топлива
18. petrol/gasoline бензин
19. conventional обычный, стандартный; общепринятый
20. high-pressure pump насос высокого давления
21. high-pressure pipe трубка высокого давления
22. rubber tube резиновая трубка; резиновый шланг
23. multi-point fuel injection впрыск топлива во впускной тракт; многоточечный впрыск
24. port injection system система впрыска во впускной канал
25. intake port входное отверстие; впускное отверстие; впускной канал
26. direct injection system система прямого впрыска
27. high-pressure fuel pump топливный насос высокого давления
28. common rail injection system
29. psi (pound per square inch) фунт на квадратный дюйм (0,07 кг/см2)
30. bar бар (единица давления)

Exercise 2. Read the international words and guess their meanings.

Carburetor, system, operation, component, filter, gas, vacuum, electric, motor, plunger, injector, control, computer, basic, idea, construction, metal, modern, location, distance, model, cylinder, mechanical, result, stop, electronic, provide, electric, mix, form, mixture, top, maximum, venturi, device, protect, automatically, energize, start, deactivate, relay.

Exercise 3. Read and translate Text 1.

Text 1. How Does a Car Fuel System Work?

Source: https://completecar.ca/maintenance/fuel-system/

Carburetors were used more than 100 years ago until the 90s when they were almost completely replaced by the electronic fuel injection system. Despite being more complex, a fuel injection system allows a car to be faster and consume less fuel because it can better manage the amount of fuel going into the combustion chamber. The fuel system plays a vital role in the operation of your vehicle. If you want to get the most out of your vehicle, you'll need to take care of its components.

Many things have to work together for a properly working fuel system. In the fuel tank, air and vapors enter from its vent. The fuel needs to be forced out of the tank, through the filter, and into the engine. A big enough pump (usually electric) forces this process along. The fuel pump is usually mounted inside the gas tank because there's no good place to put it outside without it being too susceptible to damage or weather conditions. The fuel pump creates a vacuum, and gas is forced into this partial vacuum created by the movement of a plunger driven by an electric motor.

The fuel will go through the filter, where dirt and other particles are removed (this isn't always done). From here, it goes to the carburetor or fuel injectors. In older cars, this is where a lot of dirt and gunk from inside the gas tank ends up. Once the gas leaves the carburetor or fuel injectors, it's now under pressure and gets pushed into the engine. The carburetor has a throttle plate that controls how much gas can be injected, so you open this plate up more if you need to increase power. Some cars have a carburetor and then a fuel injection system. Some cars have only fuel injection. To sum up, the basic idea of the way how the fuel system works is that the gas is put under pressure by the electric fuel pump, it is mixed with air by the carburetor or fuel injectors, then forced into the engine.

There are two types of fuel systems, and both work differently. A carburetor system is the most common fuel system, which is still in use in many cars with an internal combustion engine. In this, air and gasoline mixture is supplied to the engine with the help of a small rubber tube fitted on a carburetor which mixes air with gasoline when it flows through small jets present in the carburetor.

A fuel injection system is also known as a petrol injection system due to its working on petrol/gasoline. It is an advanced version of the conventional fuel system, which works with the help of a high-pressure pump and injects gasoline into the combustion chamber at very high pressure, supplied through a high-pressure pipe. A high-pressure pump is used to pressurize gasoline from the tank, so there is no need for a rubber tube as in a carburetor system. Such injection systems are known as computer controlled multi-point fuel injection systems due to multiple injectors fitted for proper working.

There are mainly three types of fuel injection systems are used in cars today. In a port injection system fuel is injected directly into the intake ports of the combustion chamber where air enters for mixing with fuel for proper working.

A direct injection system is also known as petrol direct injection (PDI) or simply central high-pressure fuel pump (CHFP) system. In this, fuel is injected directly into the combustion chamber for proper mixing of air and gasoline before entering the cylinder.

A common rail injection system works with the help of a high-pressure pump fitted on it, which pressurizes fuel up to 2500 psi/172 bar at the time of injection.

Exercise 4. Answer the questions.

1. When did electronic fuel injection systems appear?
2. What are the advantages of a fuel injection system?
3. What device helps the fuel to get out of the tank, through the filter, into the engine?
4. Why is the fuel pump usually located inside the gas tank?
5. What is the function of a fuel filter?
6. Where does the fuel go after the filter?
7. Where does the fuel get pushed after the carburetor or fuel injectors?
8. What part of a car mixes fuel and air?
9. How many types of fuel systems do you know?
10. Which system is used in many cars with an internal combustion engine?
11. How does a carburetor system work?
12. Why is a fuel injection system also called a petrol injection system?
13. How does the fuel injection system work?
14. What types of fuel injection systems are used in modern cars?
15. What is the principle of operation in a port injection system?
16. How does a direct injection system work?
17. How does a common rail injection system operate?

Exercise 5. Complete the sentences with the words given in the box.

Air, filter, carburetor, tank, injectors, pump

1. The electronic fuel injection system almost completely replaced … . 2. A fuel … forces the fuel out of the tank, through the filter, and into the engine. 3. A fuel … removes dirt, rust and other impurities from fuel. 4. A part that mixes fuel and air is called a carburettor or fuel … . 5. The gas … is a storage container for fuel. 6. … and vapors enter from the vent in the fuel tank.

Exercise 6. Match types of fuel systems (1-5) with their descriptions (a-e).

1. A carburetor system	a. This system works on gasoline. It has a high-pressure pump that injects gasoline into the combustion chamber at very high pressure, supplied through a high-pressure pipe.
2. A fuel injection system	b. In this system, fuel is injected directly into the combustion chamber for proper mixing of air and gasoline before entering the cylinder.
3. A port injection system	c. In this system, a carburettor mixes air with gasoline when it flows through small jets in it. Then this mixture goes to the engine through a small rubber tube.
4. A direct injection system	d. This system works with the help of a high-pressure pump fitted on it, which pressurizes fuel up to 2500 psi/172 bar at the time of injection.
5. A common rail injection system	e. In this system fuel is injected directly into the intake ports of the combustion chamber where air enters for mixing with fuel for proper working.

Exercise 7. Read and memorize the words and word combinations.

1. fuel pressure regulator регулятор давления топлива
2. fuel filter топливный фильтр
3. fuel line/pipe топливопровод; бензопровод
4. fuel rail направляющая-распределитель для топлива (в системах впрыска)
5. pressure sensor датчик давления
6. fuel gauge измеритель горючего; топливный расходомер, бензиномер
7. fuel pump relay реле насоса для подачи горючего, бензопомпы
8. gasoline бензин
9. rubberized прорезиненный; покрытый резиной
10. rear axle задняя ось; задний мост
11. delivery pipe подающая труба; нагнетательная труба
12. kgf килограмм-сила
13. trigger запускать, приводить в движение; толкать
14. fuel flow поток топлива
15. wasted растраченный понапрасну
16. clogged up засорен; забит грязью; закупорен
17. fuel supply подача топлива
18. stalling потеря скорости; остановка; заглохание двигателя
19. fuel hose шланг подачи топлива
20. inlet ввод; впуск; вход; впускное отверстие
21. spring пружина
22. input port входное отверстие; впускное отверстие; вход
23. output выпуск; выход
24. monitor мониторить, отслеживать, контролировать
25. performance действие; исправная работа
26. high-pressure имеющий/использующий/рассчитанный на высокое давление, высоконапорный, высокого давления
27. quantity количество
28. injection впрыск (топлива)
29. electric current электрический ток
30. valve клапан
31. coil катушка; обмотка
32. hydraulic throttle гидравлический дроссель
33. cable-driven с тросовым приводом
34. throttle valve дроссельный клапан
35. refuel дозаправиться, пополнить запасы топлива
36. combustible mixture топливно-воздушная смесь; горючая смесь, топливная смесь
37. closed chamber замкнутая камера
38. airflow обтекание потоком воздуха; воздушный поток
39. passage канал
40. jet needle жиклёрная игла
41. atomized распыленный, размельченный; мелкокапельный
42. venturi диффузор
43. droplet капелька
44. crank заводная ручка, рукоятка; заводить рукоятью, заводить при помощи ручного управления
45. gas mileage пробег автомобиля на единицу расхода топлива (в милях)
46. malfunction не срабатывать, работать неисправно

Exercise 8. Read and translate Text 2.

Text 2. Fuel System Components

Source: https://completecar.ca/maintenance/fuel-system/

Here are the main parts of a fuel system in internal combustion engines: a fuel tank, a fuel pressure regulator, a fuel filter, fuel lines, fuel pumps, a fuel rail pressure sensor, a fuel injector, fuel gauges, a fuel carburettor and a fuel pump relay. Let us explain the purpose, working, and construction of each of these components one by one.

Fuel tanks in cars serve the purpose of storing gasoline. The gas tank is a flexible container made of rubberized fabric in many cases. In older cars, these were often strengthened by metal sheets, or in modern cars with higher safety requirements they are completely made from steel. Modern cars usually have a gas tank that is located between the rear axle and front of the engine. The distance to the engine varies with different models.

Fuel pressure regulators keep a check on fuel pressure inside the delivery pipe of the fuel pump just before it reaches engine cylinders. The regulator maintains a pressure difference of 1-2 kgf/cm^2 (kg per square cm) across the delivery pipe. On the other hand, the fuel tank is pressurized at 20-30 kgf/cm^2. This pressure difference triggers fuel flow from the tank to the pump and then to the engine. In the case of mechanical fuel pumps, the fuel pressure regulator is not required.

A ***fuel filter*** cleans the dirt and rust from fuel that is going to be supplied to the combustion chamber. Due to this cleaning process, there are chances that some amount of fuel might get wasted. For this very reason, it is necessary to replace the fuel filter every 10,000 miles of driving or roughly after two years. If the fuel filter of a car is clogged up, it will shut down the fuel supply to the engine resulting in the car's sudden stopping or stalling.

Fuel lines/pipes are usually hoses or flexible tubes that carry motor fuel from the fuel tank to an inlet of the carburetor or an electronic injection pump. The flexibility and resistance to damage provided by using rubber for the lines.

The fuel pump is an important component of a car's fuel system. In simple words, it helps in delivering fuel from the tank to the engine. It mainly comprises of a plunger and a gas spring that pushes the fuel out through the delivery pipe to the injection system or carburetor. A car's electric pump is attached to its tank. The only link between the two is a rubber hose which is connected to the fuel pump's input port. The fuel pump output is connected to the car's engine through a rubber hose as well.

The ***fuel rail pressure sensor*** monitors the pressure in the rail to ensure the correct performance for the fuel injection system. It is usually located at the tip of the fuel injector. The fuel injection system uses high-pressure fuel to operate and relies on fuel rail pressure to control the timing and quantity of the injection.

Fuel injectors are responsible for directly injecting fuel into the engine. They use a very small electric current to open and close a special valve that allows gas to pass from a fuel line into an engine cylinder. There is also a coil around the injector that controls its movements. Fuel injectors are divided into two categories: electronic or mechanical. Mechanical systems use a mechanical fuel pump and an electric, hydraulic or cable-driven throttle. Electronic systems use an electric fuel pump and an electric motor to open the throttle valve.

Fuel gauges serve the purpose of letting drivers know when to refuel to keep their gas tanks full. Usually, when the fuel level drops below a certain point, the 'Low Fuel' light will turn on.

A ***fuel carburettor*** mixes liquid fuel with air to form a combustible mixture. The carburetor has a closed chamber that is open at the top, allowing for maximum airflow and the free flow of liquid gasoline through the walls. As the throttle valve is opened, airflow through the carburetor increases, which causes the pressure inside of the chamber to drop.

This creates a partial vacuum that draws gasoline from one of two or three different fuel passages, each with its own jet needle. The fuel must be atomized before it can burn in the fuel system. Fuel injection and carburetors use a device called a venturi to do this. A venturi is basically a constriction in the fuel line that speeds up the flow of fuel, which causes it to 'breath' or break into small droplets.

A ***fuel pump relay*** is a safety device that protects the car's fuel pump, i.e., automatically energizes the pump during crank if the car's ignition is on (even when the engine is not running). When the engine starts, it deactivates the fuel pump relay and vice versa.

Exercise 9. Match the words in English (1-20) with their Russian equivalents (a-t).

1. gasoline	a. бензопровод
2. flow	b. топливный фильтр
3. hose	c. топливный расходомер
4. electric current	d. бензин
5. fuel pipe	e. реле насоса для подачи горючего
6. clogged up	f. катушка
7. pressure sensor	g. поток
8. injection	h. шланг
9. fuel filter	i. электрический ток
10. valve	j. датчик давления
11. coil	k. камера
12. fuel rail	l. работать неисправно
13. throttle	m. клапан
14. fuel gauge	n. регулятор давления
15. chamber	o. засорен
16. fuel pump relay	p. впрыск
17. monitor	q. направляющая-распределитель для топлива
18. pressure regulator	r. дроссель
19. performance	s. контролировать
20. malfunction	t. исправная работа

Exercise 10. Match the words (1-10) with their definitions (a-j).

1. fuel tank	a. a safety device that protects the car's fuel pump
2. fuel pressure regulator	b. a hose/tube that delivers motor fuel from the fuel tank to the carburetor or an electronic injection pump
3. fuel filter	c. an instrument that measures and gives a visual display of the amount or level of fuel
4. fuel line/pipe	d. a storage container for fuel
5. fuel pump	e. the nozzle and valve through which fuel is sprayed into a combustion chamber of the engine
6. fuel rail pressure sensor	f. the part of a car engine, in which air and petrol are mixed together to form a vapour which can be burned
7. fuel injector	g. a device that screens out rust, dirt, etc. in the fuel
8. fuel gauge	h. a device that controls fuel pressure inside the delivery pipe of the fuel pump
9. fuel carburettor	i. a device using pressure to deliver fuel from the tank to the engine
10. fuel pump relay	j. a device that measures the pressure in the rail to make sure the correct performance for the fuel injection system

Exercise 11. Complete the sentences with the words given in the box.

Pipe, connected, near, carburetor, fuel, produce, tank, gauges, mounted

1. The fuel system consists of a tank, a pressure regulator, a filter, pipes, a pump, a rail pressure sensor, an injector, …, a carburettor and a pump relay. 2. The fuel is stored in a fuel … . 3. The fuel tank is … to a fuel line. 4. The fuel … carries fuel to the fuel pump. 5. Electric pumps are … near the tank. 6. Mechanic pumps are located … the engine. 7. The … pump is connected to the carburetor. 8. The fuel is mixed with air by … and then this mixture goes into the engine. 9. In the engine the fuel and air are burnt and … power.

Exercise 12. Work in pairs. Read and translate a dialogue between a mechanic and a customer. Act it out.

Mechanic: Hello! How can I help you?

Customer: Well, I can see dark spots under the car after fuelling it up.

M.: I see. Do you feel fuel smell inside the car?

C.: Yes, I do. And the gas mileage is poor. What's wrong with my car?

M.: It looks like the fuel system malfunctions. First, let me check fuel lines going to the fuel tank for damage. Well, there's a fuel leak. They need to be replaced.

C.: Okay. And what are these rubber hoses?

M.: They carry fuel to injectors. They have some small cracks and signs of wear. I'll replace them, too.

C.: Are there any more problems?

M.: Yeah, the fuel injectors are slightly clogged. They need to be cleaned. And when did you replace the fuel filter?

C.: Oh, I don't remember. Maybe three years ago… Anything wrong with it?

M.: Yes, it's clogged with dirt as well. It should be changed every 10,000 miles of driving. I'm afraid it needs to be replaced. And I'll change the air filter, too.

C.: Fine. When will the car be ready?

M.: Tomorrow at 10 a.m. And I advise you to have the fuel system serviced at least once in two years. It can be dangerous to drive a car with such serious problems!

C.: I see. Thank you very much! See you tomorrow!

Exercise 13. Look through Unit 16 again. Make a list of the words and word combinations you consider to be the terms. Translate them into Russian.

Unit 17. EXHAUST SYSTEM

Exercise 1. Read and memorize the words and word combinations.

1. exhaust system система выпуска отработавших газов; выхлопная система
2. exhaust gases выхлопные газы; отработавшие газы
3. harmful substance вредное вещество
4. discharge выводить; выпускать
5. purified exhaust gases очищенные выхлопные газы
6. occupant пассажир
7. channel канал выхлопной системы
8. flow resistance гидравлическое сопротивление, сопротивление потока
9. exhaust back pressure противодавление отработавших газов
10. extreme stress экстремальные/сильные нагрузки
11. fuel-air mixture горючая смесь, топливная смесь; топливно-воздушная смесь

12. abruptly heated резко нагретый
13. expand расширяться; увеличиваться в объёме, в размерах, в количестве
14. supersonic speed сверхзвуковая скорость
15. noise level уровень шума (от выхлопа); уровень помех
16. crack of an explosion хлопок как при взрыве; взрыв
17. reduced пониженный; уменьшенный
18. dBa (decibels adjusted) децибел – единица измерения взвешенной мощности шума, которая определяется как отношение уровня шума к измерительному (контрольному) уровню 3,16 пВт (-85 дБм)
19. exhaust valve выпускной клапан
20. bodywork конструкция кузова; кузов легкового автомобиля
21. jolting тряска
22. carriageway проезжая часть дороги
23. resist противостоять; устоять; не подвергаться
24. corrosion attack коррозионное воздействие/разрушение
25. hot gases нагретые газы
26. acid кислота
27. moisture влажность; влага; сырость
28. splashed water брызги воды
29. catalyst каталитический нейтрализатор (отработавших газов)
30. poison испортить (вредными примесями)
31. sulfur сера
32. lead свинец

Exercise 2. Read the international words and guess their meanings.

Function, system, collect, gas, cylinder, occupant, channel, resistance, select, component, coordinate, design, engineer, specific, stress, mixture, temperature, vibration, corrosion, attack, salt, risk, catalyst, modern, computer, maximum, economy, sensor, convert, manufacture, technology, standard, emissions, produce, efficiency, limit, pulse, pulsating, energy, basic, option, absorption, principle, element, effect, create, resonator, mini, dioxide, oxide.

Exercise 3. Read and translate Text 1.

Text 1. Functions of the Exhaust System

Source: https://learnmech.com/exhaust-system-components-and-their-functions/

The exhaust system collects the exhaust gases from the cylinders, removes harmful substances, reduces the level of noise and discharges the purified exhaust gases at a suitable point of the vehicle away from its occupants. The exhaust system can consist of one or two channels depending on the engine. The flow resistance must be selected so that the exhaust back pressure affects engine performance as little as possible. To ensure that the exhaust system functions perfectly, its components must be coordinated by the design engineers in line with the specific vehicle and engine.

The exhaust system is also subject to extreme stresses. The fuel-air mixture in the cylinders is abruptly heated to temperatures up to 2,400 °C. This causes it to expand greatly before escaping into the exhaust system at supersonic speed. This noise level resembles the crack of an explosion and must be reduced by approx. 50 dBa as it travels from the engine exhaust valve to the end of the exhaust system.

Apart from temperature and pressure stresses, the exhaust system must also cope with vibrations from the engine and bodywork as well as vibrations and jolting from the carriageway. The exhaust system additionally has to resist corrosion attacking from the in-

side caused by hot gases and acid, and from the outside in the form of moisture, splashed water and salt water. There is also the risk that the catalyst may be poisoned through sulfur or lead present in the fuel.

Exercise 4. Answer the questions.

1. What are the functions of an exhaust system?
2. How many channels can the exhaust system have?
3. What stresses must the exhaust system cope with?
4. Why does the noise level resemble the sound of explosion?
5. What is the required noise level?
6. What vibrations must the exhaust system withstand?
7. What else does the exhaust system have to resist?

Exercise 5. Complete the sentences about the exhaust system with the words given in the box.

Inside, pressure, bodywork, lead, exhaust, saloon

1. The … system is a car's waste-disposal system. 2. Its functions are to collect the exhaust gases from the cylinders, take harmful substances away, limit sound and discharges the purified exhaust gases away from the passenger … . 3. The exhaust system experiences extreme temperature and … stresses. 4. It must withstand vibrations from the engine, … and jolty driving. 5. The exhaust system must have strong resistance to … and outside corrosion. 6. Sulfur or … from the fuel may damage the catalyst.

Exercise 6. Read and memorize the words and word combinations.

1. exhaust manifold выпускной коллектор; выпускной трубопровод
2. cylinder head головка цилиндра; крышка цилиндра
3. exhaust выхлоп; отработавшие газы
4. exhaust pipe выхлопная труба
5. cast iron чугун
6. oxygen sensor кислородный датчик
7. subtract уменьшить
8. catalytic converter каталитический нейтрализатор/дожигатель отработавших газов; каталитический конвертер
9. muffler like что-то вроде глушителя поглотительного типа
10. carbon monoxide угарный газ; окись углерода; оксид углерода
11. hydrocarbon углеводород
12. water vapor водяной пар
13. carbon dioxide диоксид углерода; углекислый газ, двуокись углерода
14. nitrogen oxides оксиды азота
15. selective catalytic reduction избирательная каталитическая нейтрализация (отработавших газов); селективное каталитическое восстановление; система снижения токсичности выхлопа
16. emission эмиссия; дымогазовые выбросы
17. exhaust emission standard стандарт на содержание отработавших газов
18. heavy-duty truck тяжёлый грузовой автомобиль
19. ammonia аммиак
20. fuel efficiency эффективность использования топлива
21. muffler/silencer глушитель
22. internal combustion engine двигатель внутреннего сгорания

23. exhaust noise шум выхлопа
24. sound energy звуковая энергия, энергия звука
25. exhaust gas flow поток выхлопных газов
26. reflection отражение (света, тепла, звука)
27. exhaust chamber выпускная камера
28. exhaust flap выпускная заслонка
29. sound-absorbing звукопоглощающий
30. sound-modifying снижающий шум
31. frequency частота
32. outlet выход; выпускной канал; выпускное отверстие
33. acceptable level допустимый уровень
34. combustion process процесс сгорания
35. baffle дефлектор
36. dissipate рассеивать (энергию)
37. fiberglass pack набивка из стекловолокна
38. sound muffling material звукопоглощающий материал
39. tailpipe выводящая труба глушителя
40. tubing трубы
41. aluminized steel алитированная листовая сталь
42. plain steel нелегированная сталь

Exercise 7. Read and translate Text 2.

Text 2. Components of Exhaust System

Source: https://learnmech.com/exhaust-system-components-and-their-functions/

The ***exhaust manifold*** attaches to the cylinder head and takes each cylinder's exhaust and combines it into one pipe. The manifold can be made of steel, aluminium, stainless steel, or more commonly cast iron.

An ***oxygen sensor*** is used in all modern fuel injected cars to measure how much oxygen is present in the exhaust. Based on this data, the computer can add or subtract fuel to obtain the correct mixture for maximum fuel economy. The oxygen sensor is mounted in the exhaust manifold or close to it in the exhaust pipe.

A ***catalytic converter*** is a muffler like part that converts harmful carbon monoxide and hydrocarbons to water vapor and carbon dioxide. Some converters also reduce harmful nitrogen oxides. The converter is mounted between the exhaust manifold and the muffler. Selective catalytic reduction (SCR) is the technology applied by the majority of truck and engine manufacturers to meet 2010 emissions standards for heavy-duty trucks. This technology uses ammonia to break down dangerous nitrogen oxides emissions produced by diesel engines into nitrogen and water. Aside from helping the environment, the biggest benefit of SCR for vehicle owners is the fuel efficiency the technology provides.

The ***muffler/silencer*** is used to limit sound. Every internal combustion engine produces 'exhaust noise' due to the pulsating emission of gases from the cylinders. This noise has to be silenced by reducing the sound energy of the exhaust gas flow. There are two basic options here: absorption and reflection of the sound in the silencer. These two principles are generally combined in a single silencer. Exhaust chambers and exhaust flaps are other sound-absorbing and sound-modifying elements that can be used to eliminate especially undesirable frequencies from the outlet noise. Catalytic converters also have a sound-absorbing effect. The muffler serves to quiet the exhaust down to acceptable levels. Remember that the combustion process is a series of explosions that create a lot of noise. Most mufflers use baffles to bounce the exhaust around dissipating the energy and quiet-

ing the noise. Some mufflers also use fiberglass packing which absorbs the sound energy as the gases flow through.

The ***resonator*** is like a mini-muffler. Since the muffler alone cannot always quiet all the engine noise, many exhaust systems also include a resonator. They are usually straight pipes filled with sound muffling materials. The resonator can be either before or after the muffler in the exhaust system.

The ***exhaust pipe*** is between all of the above mention parts. It carries the gas through its journeys out your tailpipe. Exhaust tubing is usually made of steel but can be stainless steel (which lasts longer due to its corrosion resistance) or aluminized steel tubing. Aluminized steel has better corrosion resistance than plain steel but not better than stainless steel. It is, however, cheaper than stainless steel.

Exercise 8. Match the words in English (1-15) with their Russian equivalents (a-o).

1. exhaust system	a. выхлопные газы
2. exhaust manifold	b. кислородный датчик
3. channel	c. выпускная камера
4. exhaust pipe	d. резонатор
5. tailpipe	e. выпускной коллектор
6. exhaust gases	f. каталитический конвертер
7. muffler/silencer	g. выхлопная система
8. fuel-air mixture	h. выхлопная труба
9. exhaust chamber	i. выводящая труба глушителя
10. exhaust flap	j. глушитель
11. oxygen sensor	k. канал
12. resonator	l. шум выхлопа
13. catalytic converter	m. горючая смесь
14. exhaust noise	n. выпускное отверстие
15. outlet	o. выпускная заслонка

Exercise 9. Match the words (1-7) with their definitions (a-g).

1. catalytic converter	a. a device which detects or measures a physical property and records, indicates, or otherwise responds to it
2. manifold	b. an engine that creates its energy by burning fuel inside itself; most cars have this type of engine.
3. sensor	c. a tube that carries gasses to the muffler
4. internal combustion engine	d. a device which is fitted to a car's exhaust to reduce the pollution coming from it
5. muffler	e. the end pipe of a car's exhaust system
6. tailpipe	f. (in an internal-combustion engine) the part that leading exhaust from the cylinders to the exhaust pipe
7. exhaust pipe	g. a silencer for a motor vehicle exhaust

Exercise 10. Complete the sentences with the words given in the box.

Information source: https://xn--80agabe1dc1k.xn--p1ai/wp-content/uploads/2021/02/English-for-Car-mechanics-2021.pdf

Aluminized, five, condenses, converters, steel, moisture, depends, system, catalytic

1. Exhaust … components are designed for a specific engine. 2. The pipe diameter, component length, … converter size, muffler size, and the exhaust manifold design are en-

gineered to provide proper exhaust flow, silencing, and emission levels on a particular engine. 3. Mufflers on vehicles with catalytic … run hotter and last longer than those on older vehicles without converters. 4. Rust in mufflers is caused by … in the exhaust. 6. Moisture … in the muffler when the engine is shut off and the muffler starts to cool. 7. The longevity of muffler and pipes … on what kind of steel the components are made of, how pipes are routed under the car, where the muffler is located, and whether or not the vehicle has a catalytic converter. 8. Original equipment pipes made of stainless … can last up to 10 years or more. 9. Most aftermarket pipes are made of ordinary steel which is good for about three to … years of service. 10. … and stainless pipes are better but cost more.

Exercise 11. Read and translate the text.

Text 3. How to Identify Problems in the Exhaust System

Source: https://learnmech.com/exhaust-system-components-and-their-functions/

Although the exhaust system is located underneath the vehicle, there are some symptoms which may indicate a problem with your exhaust.

1. ***Noises***

– A loud roaring noise could indicate corrosion of the exhaust system.

– A hissing sound could mean that gas is escaping through a crack or hole in one of the exhaust system components.

– Chugging noises mean that there may be a blockage in one of the pipes.

– A persistent and rapid succession of knocking sounds indicate that a part of the exhaust may have come loose.

2. ***Emissions***

– A white smoke isn't a smoke. In fact, it's vapor and you should see it when you first start your car as it indicates that the engine is warming up. If white smoke is visible after the engine is warm it may indicate internal leaks or cracks.

– A bluish-grey smoke means that oil may be burning in the combustion chamber. This could mean that the cylinder is worn or there are leaks in the valve seals.

– A very black smoke is often accompanied by increased fuel consumption and may signify leaks in the exhaust system or a problem with the engine.

3. ***Visual Inspection***

Inspect the components of your exhaust that you can see for any signs of rust or corrosion. Make sure you keep an eye on any cracks and holes and other signs of damage.

Exercise 12. Work in pairs. Read and translate a dialogue between a mechanic and a client. Act it out. Make your own dialogue based on ideas from Text 3.

Mechanic: Hello! How can I help you?

Client: Well, I think there's a problem with the exhaust system of my car.

M.: Why do you think so?

C.: I can hear a strange noise…

M.: What kind of noise? Is it a loud roaring one or a hissing sound?

C.: Well, I guess it's the hissing sound. What's wrong with my car?

M.: It could mean that gas is escaping through a crack or hole in one of the exhaust system components. I'll inspect them for any signs of damage, rust or corrosion. We provide free visual inspection this month.

C.: Great! And I also wanted to say about a smoke.

M.: Okay. Do you have white, blue or black smoke?

C.: White smoke mostly...

M.: Can you see it when you first start your car or after the engine is warm?

C.: After… what does it mean?

M.: Well, it may indicate internal leaks or cracks. And what about blue smoke?

C.: Yeah. I saw a bluish-grey smoke a few times.

M.: This could mean that the cylinder is worn or there are leaks in the valve seals. I'll check them, too. And I'll replace them, if needed. You may come back in the evening. Your car will be ready.

C.: Fine. See you later then!

Exercise 13. Look through Unit 17 again. Make a list of the words and word combinations you consider to be the terms. Translate them into Russian.

Unit 18. ENGINE AND CHASSIS LUBRICATION SYSTEMS

Exercise 1. Read and memorize the words and word combinations.

1. lubrication system система смазки
2. lubrication oil смазочное масло; смазочный материал
3. moving parts подвижные узлы; трущиеся детали; подвижные детали
4. friction трение; сила трения
5. wear износ; worn изношенный
6. seizure заедание (вследствие недостатка смазки и перегрева); застревание; заклинивание
7. act as выполнять функцию
8. cooling medium охлаждающая среда
9. piston ring поршневое кольцо
10. ring groove канавка поршневого кольца
11. oilway масляная магистраль
12. shock толчок; удар
13. bearing подшипник
14. engine noise шум двигателя
15. engine life срок службы двигателя, ресурс двигателя
16. seal уплотнение
17. cylinder wall стенка цилиндров; рабочая поверхность цилиндров
18. deposition отложение
19. carbon deposition нагарообразование
20. soot копоть; сажа
21. lacquer лаковые отложения (на деталях)
22. harmful substance вредное вещество
23. incomplete combustion неполное сгорание
24. component элемент, компонент; деталь; узел
25. corrosive attack коррозионное воздействие; коррозионное разрушение
26. acid кислота
27. combustion process процесс сгорания
28. oxidation окисление
29. sludge осадок
30. scored шероховатый
31. burned-out bearing расплавившийся подшипник
32. misfire давать осечку, давать пропуски зажигания
33. stuck заклинивший

34. deposit осадок; налёт; отложение
35. excessive fuel consumption перерасход топлива
36. engine lubrication system система смазки двигателя
37. chassis lubrication system система смазки шасси
38. pressure system система подачи смазки под давлением
39. splash system система подачи смазки разбрызгиванием (самотеком)
40. single system автономная система
41. water pump водяной насос
42. distributor распределитель
43. main bearing коренной подшипник
44. connecting rod тяга, шатун
45. wrist pin поршневой палец
46. camshaft bearing cam кулачок подшипника распределительного вала
47. valve клапан
48. crankcase картер двигателя
49. gear pump шестерёнчатый насос
50. rotating вращающийся
51. reciprocating совершающий возвратно-поступательное движение
52. connecting rod end головка шатуна
53. lubrication point точка смазки
54. dipper черпачок на шатуне для смазки разбрызгиванием
55. lubricant смазочный материал, смазка
56. devise разрабатывать

Exercise 2. Read the international words and guess their meanings.

Motor, term, mechanics, system, filter, absorb, shock, form, cylinder, result, metallic component, corrosive attack, process, final, correctly, type, serious, cylinder, deposits, system, chassis, combination, starter, generator, distributor, circulate, reservoir, modern, American, passenger, cars, design, construction, universal.

Exercise 3. Read and translate Text 1.

Text 1. Engine Lubrication System and Chassis Lubrication System

Information sources: https://www.theengineerspost.com/types-of-lubrication-system/, https://www.theengineerspost.com/lubrication-system-in-automobile/

Lubrication is essentially required in motor vehicle maintenance. The term ‘lubrication’ in mechanics means putting a lubrication oil between all the moving parts of a car. It helps to reduce friction, wear and to prevent seizures.

Also, the lubrication system acts as a cooling medium for removing heat. It keeps the engine parts clean, especially piston rings and ring grooves, oilways and filters. It absorbs shocks between bearings and other engine parts; therefore, it reduces engine noises and increases engine life. The lubrication system forms a good seal between piston rings and cylinder walls. It prevents deposition of carbon, soot and lacquer. It absorbs and carries away harmful substances resulting from incomplete combustion. It also prevents metallic components from corrosive attack by the acid formed during the combustion process. And finally, the lubrication system helps to resist oxidation which causes sludge and lacquers.

Lubrication must be done correctly and the right type of lubrication should be used. Improper lubrication of the engine may cause serious troubles such as scored cylinders, dirty spark plugs, worn or burned-out bearings, misfiring cylinders, stuck piston rings, engine deposits and sludge, and excessive fuel consumption.

In motor vehicles, there are two separate systems of lubrication. They are the engine lubrication system and the chassis lubrication system.

The ***engine lubrication system*** may be either a pressure or splash type. Although various combinations of these two systems are used as well. A single system lubricates the whole engine of all modern-day motor vehicles. As to equipment located outside the engine, such as a starter, generators, a water pump and distributors, it is lubricated separately.

This system circulates the oil from a reservoir to the main bearing, connecting rod bearings, wrist pins, camshaft bearing cams, cylinder walls and valves. The pump is located at the bottom of the crankcase.

All modern American passenger cars and trucks use the pressure system in which oil is forced under pressure by a gear pump to the various rotating and reciprocating parts. In the splash system, the connecting rod end has a dipper which splashes the oil on the various parts as it goes through the oil while the connecting rod moves.

In the ***chassis lubrication system***, each lubrication point is lubricated separately. These points may vary from 21 to 45 depending on the design and construction of the vehicle. No single universal lubricant has been devised for all these points yet. Some of the lubrication points require to be lubricated more often than others.

Exercise 4. Answer the questions.

1. What does lubrication mean?
2. What functions does a lubrication system perform?
3. What troubles may improper lubrication of the engine cause?
4. How many separate systems of lubrication are there in a motor vehicle?
5. What are the two types of the engine lubrication system?
6. What does a single system lubricate?
7. How is the equipment outside the engine lubricated?
8. What is the principal of operation of the engine lubrication system?
9. How does a pressure system work?
10. How does a splash system function?
11. How many lubrication points can be in a chassis lubrication system?
12. Has a universal lubricant been devised?

Exercise 5. Match the words in English (1-20) with their Russian equivalents (a-t).

1. lubrication system	a. подвижные детали
2. lubrication oil	b. износ
3. moving parts	c. система смазки
4. friction	d. подшипник
5. wear	e. нагарообразование
6. piston ring	f. смазочное масло
7. bearing	g. копоть; сажа
8. cylinder wall	h. трение
9. carbon deposition	i. система подачи смазки разбрызгиванием
10. soot	j. шатун
11. pressure system	k. клапан
12. splash system	l. поршневое кольцо
13. bearing	m. картер двигателя
14. connecting rod	n. шестерёнчатый насос
15. camshaft	o. система подачи смазки под давлением

16. valve	p. стенка цилиндров
17. crankcase	q. точка смазки
18. gear pump	r. черпачок на шатуне
19. lubrication point	s. распределительный вал, кулачковый вал
20. dipper	t. подшипник

Exercise 6. Complete the sentences with the words given in the box.

Metallic, splash, harmful, chassis, lubrication, friction, pressure

1. The lubrication system helps to reduce … and wear of the moving parts in a car. 2. The lubrication system protects … components from various corrosive attacks. 3. Hot moving parts are cooled down with the help of the … system. 4. The lubrication system absorbs and carries away … substances resulting from incomplete combustion. 5. A gear pump creates … to deliver oil to the various rotating and reciprocating parts. 6. In the … system, the connecting rod dipper splashes the oil on the various parts. 7. In the … lubrication system, each point is lubricated separately.

Exercise 7. Work in pairs. Read and translate a dialogue between an experienced mechanic and a new mechanic. Act it out.

Mechanic 1: Have you finished with this car?

Mechanic 2: Yes, sure.

M. 1: What was the trouble with it?

M. 2: An increased oil consumption.

M. 1: Let's review what you did before we give the car back to the customer.

M. 2: Okay. First, I checked and replaced some gaskets. I thought about possible leakage through them… Then, I checked the oil sump for damage. But it's all right.

M. 1: And did you check the crankcase ventilation? It could be clogged.

M. 2: Yeah, you're right. It was pretty dirty. I cleaned it. So, it's fine now.

M. 1: The increased oil consumption can be also caused by some timing malfunctions.

M. 2: The timing doesn't need any repairs. It works properly.

M. 1: Fine. And what about the oil filter?

M. 2: I changed it. It was full of dirt.

M. 1: And did you check the correct installation of the oil filter? If it is installed unevenly, it won't be twisted completely. I mean the tightness of the filter will be broken.

M. 2: Of course, I did.

M. 1: Good job! I'll call the customer and tell him that his car is ready.

Exercise 8. Work in pairs. Read and translate the information about one more possible malfunction of the lubrication system in cars. Make a dialogue between an experienced mechanic and a new mechanic. Act it out.

Source: https://avtotachki.com/en/chto-nuzhno-znat-o-smazke-dvigatelya

Malfunction symptom: The system pressure dropped.

Possible malfunctions: The filter is heavily clogged. The pump is broken. The pressure reducing valve is broken. The oil level is low. The pressure sensor is broken.

Solutions: Check and replace the filter, check and repair faulty parts.

Exercise 9. Look through Unit 18 again. Make a list of the words and word combinations you consider to be the terms. Translate them into Russian.

Unit 19. TYPES OF LUBRICATION SYSTEM IN AUTOMOBILE

Exercise 1. Read and memorize the words and word combinations.

1. petroil system система смазки маслом, смешанным с бензином
2. splash system система подачи смазки разбрызгиванием (самотеком)
3. pressure system система подачи смазки под давлением
4. semi-pressure system комбинированная смазочная система (частично под давлением и частично самотеком)
5. dry sump system система смазки с сухим картером
6. wet sump system система смазки с поддоном «мокрого» типа; система смазки с мокрым картером
7. oil pump масляный насос
8. petrol tank бензобак, бак для бензина
9. starvation недостаточность; нехватка
10. black/dark smoke дымность выхлопа, вызванная неполным сгоранием топлива; темная окраска отработавших газов
11. excessive carbon deposit усиленное нагарообразование; сильный нагар; значительный слой нагара
12. cylinder head головка цилиндра; головка блока цилиндров
13. crank кривошип
14. crank chamber кривошипно-шатунная камера
15. oil particle масло в виде мелких капель; мельчайшие частицы масла
16. bearing surface поверхность подшипников
17. piston pin поршневой палец
18. separate off отделять(ся)
19. clogging закупоривание, закупорка, засорение
20. passage канал; отверстие
21. oil sump поддон картера
22. dipper черпачок на шатуне для смазки разбрызгиванием
23. connecting rod соединительный шток; соединительная тяга; шатун
24. become oil mist разбиваться на мелкие капли, образуя масляный туман
25. crankshaft bearing подшипник коленчатого вала
26. large end bearing шатунный подшипник
27. pressure feed подача под давлением
28. strainer сетчатый фильтр
29. oil gallery масляный канал; канал для смазки
30. main bearing коренной подшипник
31. crankpin шатунная шейка
32. timing gear шестерня распределительного вала
33. camshaft распределительный вал, кулачковый вал
34. oil line маслопровод
35. oil-pressure gage масляный манометр; указатель давления масла
36. oil strainer сетка маслозаборника; масляный фильтр
37. spray nozzle форсунка (для распыления, разбрызгивания)
38. cam кулачок
39. cylinder walls рабочая поверхность цилиндров; стенки цилиндров
40. bearing load нагрузка на подшипник; давление на подшипник
41. engine speed скорость/частота вращения двигателя, число оборотов двигателя
42. scavenging pump откачивающий насос, отсасывающий насос; продувочный

насос

43. pressure pump нагнетательный насос
44. tank бак (в котором хранится моторное масло)
45. oil cooler масляный радиатор
46. the engine can sit a little lower позволяет уменьшить высоту двигателя
47. center of gravity центр тяжести
48. stability at speed устойчивость при движении на скорости
49. extra oil излишки масла

Exercise 2. Read the international words and guess their meanings.

System, scooter, motorcycle, mix, proportion, carburettor, popular, method, stationary, accumulate, action, affect, Jeep, transfer, filter, central, kilogram, centimetre, instrument panel, show, metal, combination, located, base, extract, spray, center of gravity, stability, sport.

Exercise 3. Read and translate Text 1.

Text 1. Different Types of Lubrication System in Automobile

Sources: https://www.theengineerspost.com/types-of-lubrication-system/, https://www.engineeringchoice.com/what-is-engine-lubrication-system/

There are six main types of lubrication system. They are a petroil system, a splash system, a pressure system, a semi-pressure system, a dry sump system and a wet sump system.

The ***petroil system*** is commonly used in scooters and motorcycles which have the two-stroke petrol engines. It is the simplest form of the lubricating system. It does not have any separate part like an oil pump. The lubricating oil is added to the petrol itself during filling in the petrol tank of the vehicle in a specified ratio (1:25-1:50). So, normally 3 to 6% of oil are mixed with the fuel. This proportion should be proper. If this proportion is less, the danger of oil starvation causes damage to the engine. If it is more, the engine gives black smoke and excessive carbon deposits on the cylinder head. When fuel enters the crank chamber during engine operation, oil particles go down into the bearing surfaces and lubricate them. The piston rings, cylinder walls, piston pins, etc. are easily lubricated in the same way. If the engine is unused for a considerable time, the lubricating oil separates off from petrol and starts clogging the passages in the carburettor. This is the main disadvantage of this system.

The ***splash system*** is the most popular and one of the cheapest methods of the lubrication system. It is used on small, stationary four-stroke engines. In this system, the lubricating oil accumulates in an oil sump. A scoop or dipper is made in the lowest part of the connecting rod. When the engine runs, the dipper dips in the oil once in every revolution of the crankshaft and cause the oil to become oil mist which splashes on the cylinder walls. This action affects engine walls, piston rings, crankshaft bearings, and large end bearings. Splash system mostly works in connection with the pressure system in an engine, some parts being lubricated by splash system and the other by a pressure system.

The ***pressure system*** is used because the splash system is not sufficient for larger engines like Ambassador, Jeep, Ashok Leyland, and others. In this system, engine parts are lubricated under pressure feed. The lubricating oil is stored in a separate tank or the sump, from which an oil pump receives the oil through a strainer and transfers it through a filter to the central oil gallery at a pressure of 2-4 kg/cm^2. The oil from the main gallery goes to the main bearings, after lubricating the main bearing, some of it goes back to the sump, some is splattered to lubricate the cylinder walls and the rest goes from a hole into the crankpin. From the crankpin, it goes to the piston pin, where it lubricates the piston

rings. To lubricate the timing gears and camshaft, the oil is led through a separate oil line from the oil gallery. An oil-pressure gauge on the instrument panel shows the oil pressure in the system. The oil filters and strainers in the system clear off the oil from dust, metal particles and other dangerous particles.

The ***semi-pressure syste*****m** is the combination of a splash system and a pressure system. The oil pressure is between 0.4 to 1 kg/cm^2. The parts such as a cylinder wall, a piston, a piston pin, a connecting rod are lubricated by the splash system and remaining parts are by the pressure system. Almost all four-stroke engines are lubricated by this semi-pressure system. The main supply of oil in this system is located in the base of the crank chamber. An oil is extracted from the bottom of the sump through a filter and delivered through an oil pump at a pressure of 1 bar. Large end bearings are lubricated through a spray nozzle. Consequently, the oil also lubricates crankshaft bearings, cams, cylinder walls and timing gears. The oil supply is measured with the help of the oil-pressure gauges. This system is less costly to install. This enables to apply high bearing loads and engine speed.

The ***dry sump system*** consists of two pumps. A scavenging pump is placed below the sump, the pressure pump is located at the tank. The scavenging pump supplies lubricating oil to the main tank through the filter and the pressure pump supplies oil to the different parts of an engine through the oil cooler. A dry-sump system has some advantages. First, the engine can sit a little lower, which gives the car a lower center of gravity and improves stability at speed. Second, it prevents the crankshaft from extra oil, so the horsepower doesn't lower. And, since the sump can be located anywhere, it can also be any size and shape. In this system, the pressure of oil is about 4 to 5 kg/cm^2. The sump is kept dry. This type of system is used in sports cars and some military vehicles.

In the ***wet sump system***, the oil is delivered from the sump strainer to different engine parts. The oil pressure is about 4 to 5 kg/cm^2. After lubrication, the oil is carried back to the oil sump. In this case, the oil is always present in the sump. Therefore, it is called a wet sump lubrication system. The advantage of a wet sump system is its simplicity. The oil is close to the place where it is applied. This system doesn't have a lot of parts to repair and it is relatively safe to build in a car.

Exercise 4. Answer the questions.

1. What types of a lubrication system can you name?
2. What vehicles use a petroil system?
3. Does the petroil system have an oil pump?
4. What is the ratio of lubricating oil and petrol in the petroil system?
5. Why this proportion should be proper?
6. How does the petroil system function?
7. What happens if the engine is not used for a long time?
8. What system is used on small four-stroke engines?
9. Where is a lubricating oil located in a splash system?
10. What is the principal of operation of the splash system?
11. Why is a pressure system used in large vehicles?
12. Where is the lubricating oil located in the pressure system?
13. How does the pressure system function?
14. How are the timing gears and camshaft lubricated?
15. What does an oil-pressure gauge on the instrument panel show?
16. What is the role of the oil filters and strainers in the system?
17. How is the combination of a splash system and a pressure system called?
18. Which parts are lubricated by the splash system in the semi-pressure system?

19. Where is the main supply of the lubricating oil located in the semi-pressure system?
20. How does the semi-pressure system work?
21. What do oil-pressure gauges measure in the semi-pressure system?
22. What does a dry sump system consist of?
23. Where are the pumps placed?
24. What are the advantages of the dry sump system?
25. What types of vehicles use the dry sump system?
26. How does a wet sump system operate?
27. What advantages of the wet sump system can you name?

Exercise 5. Match the words in English (1-12) with their Russian equivalents (a-l).

1. piston	a. насос
2. ring	b. палец
3. pump	c. коленчатый вал
4. tank	d. поддон
5. cylinder head	e. кольцо
6. crank	f. сетчатый фильтр
7. pin	g. бак
8. sump	h. поршень
9. crankshaft	i. кулачок
10. strainer	j. маслопровод
11. oil line	k. головка цилиндра
12. cam	l. кривошип

Exercise 6. Match the words (1-7) with their definitions (a-g).

1. tank	a. the force that makes it difficult for things to move freely when they are touching each other
2. sump	b. the damage or change that is caused by something being used a lot or for a long time
3. friction	c. a reservoir or a container for holding different liquids
4. wear	d. the main shaft of an internal combustion engine
5. piston ring	e. is an object with holes which separates the liquid from the solids in it
6. crankshaft	f. the place under an engine which holds the engine oil
7. strainer	g. a ring on a piston sealing the gap between the piston and the cylinder wall

Exercise 7. Work in pairs. Read and translate a dialogue between a new mechanic and an experienced mechanic. Act it out.

Information source: https://www.engineeringchoice.com/what-is-engine-lubrication-system

Mechanic 1: May I ask you a few questions about the lubrication system?
Mechanic 2: Yes, sure. Hope, I'll be able to answer them! Ha ha!
M. 1: What types of lubricants are used?
M. 2: There are four main types of lubricants. I mean oil, grease, penetrating lubricants and dry lubricants. But we deal with oil and grease mostly. So, these two are the most common.
M. 1: I see. And what's the difference between oil and other lubricants?

M. 2: Well, it's easy. You know that oil, grease and other lubricants can be used to lubricate mechanical systems, but there is a difference in the way we use them. Oil should be poured into the system which is then lubricated automatically.

M. 1: Ah, this explains why it is important to check the oil level regularly and change or add it if necessary.

M. 2: Exactly! Car lubricants play four major roles. They control friction and wear in the engine, they protect the engine from rusting, they cool the pistons, and they protect the engine oil stored in the sump from combustion gases. Indeed, viscosity is the most significant physical property of a lubricant.

M. 1: And are there any other properties a lubricant should have?

M. 2: Yes, of course. It must have a high flashpoint, pour point and chemical stability.

M. 1: Oh, thanks a lot!

Exercise 8. Look through Unit 19 again. Make a list of the words and word combinations you consider to be the terms. Translate them into Russian.

Unit 20. AUTO COOLING SYSTEM

Exercise 1. Read and memorize the words and word combinations.

1. cooling system система охлаждения
2. waste heat потерянное тепло, отбросное тепло
3. excess heat избыточное тепло
4. seizing заедание
5. fuel consumption расход топлива
6. preignition преждевременное зажигание; калильное зажигание
7. operating temperature рабочая температура
8. water pump водяной насос
9. freeze plug заглушка; пробка расширительного бака
10. cooling fan охлаждающий вентилятор
11. heater core радиатор отопителя
12. pressure cap крышка герметизированной системы
13. overflow tank резервуар для слива лишней жидкости; расширительный бачок
14. hose шланг
15. coolant охлаждающая жидкость; охладитель; хладагент
16. passage канал
17. engine block блок цилиндров (двигателя)
18. grille облицовка радиатора
19. dissipate рассеивать
20. liquid-cooled с жидкостным охлаждением
21. water-cooled с водяным охлаждением
22. air-cooled с воздушным охлаждением
23. conduction теплопроводность
24. fin ребро, пластина
25. flange выступ; гребень; фланец
26. fan вентилятор
27. water jacket водяная рубашка
28. liner гильза (цилиндра)
29. multicylinder многоцилиндровый

Exercise 2. Read the international words and guess their meanings.

Cylinder, mechanical, functions, temperature, efficient, finally, component, system, thermostat, radiator, tank, design, transfer, centrifugal type, prevent, result, control, antifreeze, elements, cabin's ventilation system, interior, block, absorb, motor, original, Volkswagen, Chevrolet, modern motorcycles, scooter, tractor, climate, atmospheric, object, circulation, intensify, ethylene glycol.

Exercise 3. Read and translate Text 1.

Text 1. The Engine-Cooling System: Functions, Components and Principle of Operation

Information sources: https://www.engineeringchoice.com/what-is-cooling-system/, https://www.theengineerspost.com/cooling-system-for-ic-engine/

All internal combustion engines require a cooling system because the combustion of fuel takes place inside the engine. Only about 30% of the heat produced by the combustion of fuel in the engine cylinders is converted into mechanical work. About 40% of the heat goes off through the exhaust. The remaining 30% of heat is waste heat. If the excess heat is not removed from the cylinders, it may result in the seizing of the piston, high fuel consumption, pre-ignition, and burning of lubricant, etc. So, a cooling system in the engine is applied to solve this trouble.

The vehicle's engine-cooling system serves three important functions. First, it removes excess heat from the engine; second, it maintains the engine operating temperature where it works most efficiently; and finally, it brings the engine up to the right operating temperature as quickly as possible.

The major components of the cooling system are the water pump, freeze plugs, the thermostat, the radiator, cooling fans, the heater core, the pressure cap, the overflow tank, and the hoses.

The ***cooling fan*** is located at the very front of the vehicle and is designed to turn on when the coolant begins to get too hot. It turns off when the coolant temperature lowers. It draws fresh air through the radiator.

The ***radiator*** is specially designed to remove the heat from the coolant by transferring it to the air blown through the radiator by the fan and incoming air from driving. Radiators are prone to leaking after years of use.

The ***water pump***, usually of the centrifugal type, propels the coolant through the engine. A broken water pump prevents the cooling system from operating, thus resulting in the engine overheating while driving.

The ***thermostat*** controls the operation of the cooling system, specifically turning the fan on and off.

A series of rubber ***hoses*** connect the radiator and the engine. The coolant flows in them. These hoses can also begin to leak after many years of use.

The ***antifreeze*** or ***coolant*** is a sweet-smelling, bright green fluid which flows through passages in the engine, attracting heat from the engine. It collects the heat and transfers it to outside air inside the radiator.

The cooling system also includes elements of the cabin's ventilation system, because engine heat is used to warm the car's interior.

A cooling system works by sending a liquid coolant through passages in the engine block and cylinder heads. As the coolant flows through these passages, it picks up heat from the engine. The heated fluid then makes its way through a rubber hose to the radiator in the front of the car. As it flows through the thin tubes in the radiator, the hot liquid is cooled by the air stream entering the engine compartment from the grille in front of the

car. Once the fluid is cooled, it returns to the engine to absorb more heat. The water pump has the job of keeping the fluid moving through the system.

Actually, there are two types of cooling systems on motor vehicles: liquid-cooled (water-cooled) and air-cooled. Air-cooled engines are found on a few older cars like the original Volkswagen Beetle, the Chevrolet Corvair, etc. An air-cooled system is generally used in small engines up to 15-20 kW. Many modern motorcycles, scooters and some tractors have it. In countries with cold climates, this system is also used in car engines. In this system, the heat is dissipated directly to the atmospheric air by conduction through the cylinder walls. It works by expanding the surface area or increasing the flow of air over the object to be cooled, or both. The outer surface area of the cylinder and cylinder head is increased with the help of fins and flanges. The air circulation around the cylinder walls and cylinder head is intensified due to fans.

In a water-cooled system, water jackets are provided around the engine cylinder or liners. The circulating water in these jackets absorbs the heat from the cylinder surface and then the heated water is cooled by the air passing in the radiator. This system is used in the engines of cars, buses, trucks, etc.

Exercise 4. Answer the questions.

1. Why do internal combustion engines need a cooling system?
2. What troubles may face a car owner if the excess heat remains in the cylinders?
3. What are the key functions of an engine-cooling system in a vehicle?
4. What does the cooling system consist of?
5. Where is a cooling fan located?
6. How does the cooling fan operate?
7. What is the role of a radiator?
8. What is the function of a water pump?
9. What does a thermostat control?
10. What are hoses used for?
11. Why is the antifreeze regarded as an essential component in the cooling system?
12. What is the principle of operation of the engine-cooling system?
13. What types of cooling systems on motor vehicles can you name?
14. What vehicles use an air-cooled system?
15. How does the air-cooled system work?
16. How does a water-cooled system function?
17. What vehicles have the water-cooled engines?

Exercise 5. Match the terms (1-7) with their definitions (a-g).

1. radiator	a. a device that automatically regulates temperature, or that activates a device when the temperature reaches a certain point
2. water jacket	b. cooled by means of a current of air
3. thermostat	c. a type of coolant, usually based on ethylene glycol, which can be added to water to lower the freezing point; used in the radiator of a motor vehicle
4. water-cooled	d. a casing containing water placed around something to protect it from extremes of temperature
5. air-cooled	e. an engine-cooling device in a motor vehicle consisting of thin tubes in which circulating water is cooled by the surrounding air
6. hose	f. cooled by the circulation of water

7. antifreeze	g. the process by which heat is directly transmitted through the material of a substance when there is a difference of temperature
8. conduction	h. a pipe made of rubber or plastic along which a liquid flows

Exercise 6. Complete the sentences with the words given in the box.

Thermostat, antifreeze, air-cooled, mixture, liquid, cooling, radiator, types

1. The key function of the … system is to cool the engine and prevent overheating. 2. There are two … of cooling systems used in modern cars: air-cooled and liquid-cooled systems. 3. An … engine is prevented from getting too hot when it is running by cool air that passes over it, rather than being cooled by a liquid. 4. In the liquid-cooled engine, the … flows around the engine to cool it. 5. The … in a car is the part of the engine which is filled with water in order to cool the engine. 6. A … is a device that switches a system on or off according to the temperature. 7. The coolant used in most cars is a … of water and antifreeze at a ratio of one to one. 8. The … is added to water to stop it freezing; it is used in car radiators in cold weather.

Exercise 7. Work in pairs. Read and translate a dialogue between two students of Mechanics. Act it out.

Information source: https://www.theengineerspost.com/cooling-system-for-ic-engine/

Student 1: What's the home work for tomorrow?

Student 2: We need to compare an air-cooling system and a water-cooling system in engine. What shall we start with?

S. 1: Well, let's start with the main characteristics. I mean the design, weight, fuel consumption and the like. I'll make a table.

S. 2: Good idea! As to the design of the air-cooling system, it's quite simple and not very expensive. And the design of water-cooling system is pretty complicated and rather costly.

S. 1: Fine. Now weight… the air-cooling system is less heavy than the water-cooling one.

S. 2: Okay. But the fuel consumption of the water-cooling system is not as high as in cars with the air-cooled engines.

S. 1: Good. I've written down… What about their installation and maintenance?

S. 2: The air-cooling system can be installed and kept in good condition easily. The maintenance isn't very expensive. As to the water-cooling system, it's difficult to install and rather costly to repair.

S. 1: And the main difference is that the air-cooling system doesn't depend on any coolant. So, there is no danger of leakage or freezing of the coolant.

S. 2: Yeah, you're right! It works smoothly and continuously. But the water-cooling system may have troubles with the coolant. Besides, if this system fails, it may cause serious damage to the engine within a short time.

S. 1: Exactly. And last but not least, the water-cooling system can be used in multicylinder engines. The air-cooling system is not suitable for them.

S. 2: It's all set now! We're ready for our lesson tomorrow.

Exercise 8. Search the Web for:

1) Advantages and disadvantages of the air-cooling system;

2) Types of the water-cooling system (the thermosyphon cooling system, impeller circulation system, pump circulation system, pressurized cooling system);

3) Advantages and disadvantages of the water-cooling system. Choose one option and make a presentation.

Exercise 9. Look through Unit 20 again. Make a list of the words and word combinations you consider to be the terms. Translate them into Russian.

Unit 21. CAR SUSPENSION SYSTEM: FUNCTIONS, PARTS AND WARNING SIGNS

Exercise 1. Read and memorize the words and word combinations.

1. suspension подвеска
2. tire air степень накаченности колес; давление в шинах
3. spring пружина; рессора
4. shock absorber/damper демпфер; амортизатор
5. linkage рычажный механизм; связь; соединение; привод
6. relative movement относительное перемещение/движение/смещение
7. rear suspension подвеска задних колёс; задняя подвеска
8. front suspension подвеска передних колёс; передняя подвеска
9. friction трение
10. steer маневрировать, управлять рулём
11. handling управление автомобилем; вождение
12. imperfection дефект, недостаток, изъян; неоднородность; несовершенство
13. bump бугор; выпуклость; неровность; удар, толчок
14. bobbing удар; качание; подпрыгивание, подскакивание
15. smooth ride плавность хода автомобиля
16. durability долговечность; срок службы; прочность
17. pothole выбоина, рытвина, яма (на дороге)
18. dissipation утеря, потеря; диссипация; рассеяние; рассеивание
19. strut стойка
20. pave укладывать дорожное покрытие
21. laws of motion законы движения
22. magnitude величина, размеры, магнитуда
23. speck дефект; изъян; неровность
24. vertical acceleration вертикальное ускорение
25. intervening посреднический; промежуточный
26. frame каркас; рама
27. downward force of gravity сила тяжести, направленная вниз
28. slam обрушиваться
29. body кузов
30. coil spring винтовая пружина
31. rod штанга (подвески)
32. joint соединение; шарнир
33. bearing опора
34. bushing втулка
35. sliding скользящий; плавный
36. steering system система рулевого управления
37. turn поворачиваться; вращаться
38. communicate сообщать
39. TLC (tender loving care) нежная любящая забота
40. continued непрерывный; беспрерывный, продолжающийся
41. bouncing подпрыгивание
42. dipping быстрый наклон к земле (передней части автомобиля)
43. drifting/pulling занос

44. sitting lower перекос
45. bumpy тряский
46. ‘nosediving’ «клевок носом»
47. worn изношенный
48. soft tire недостаточно накачанная шина
49. wheel alignment регулировка углов установки колёс
50. issue проблема

Exercise 2. Read the international words and guess their meanings.

System, shock, absorb, motor, modern, maximize, comfortable, contact, comfort, limit, kinetic energy, transfer, cabin, passenger, component, stress, principle, convert, interact, magnitude, perpendicular, vertical, structure, situation, gravity, communicate, park, indicator, manual.

Exercise 3. Read and translate Text 1.

Text 1. Suspension in a Car

Information sources: https://www.engineeringchoice.com/what-is-suspension-in-a-car-and-how-does-it-work/, https://www.theengineerspost.com/types-of-suspension-system/

A suspension is a system of tires, tire air, springs, shock absorbers, and linkages. It connects a vehicle to its wheels and allows relative movement between the two. The suspension system of a motor vehicle is divided into the rear suspension and front suspension.

Any modern car is equipped with a suspension due to its advantages. First of all, suspension systems maximize the friction between the car’s tires and the road. By maximizing friction, a driver can steer the vehicle more stably and experience more comfortable handling. The more contact the tires have with the road, the safer and more confident the driver can drive. Second, the car’s suspension system also provides additional comfort. By limiting the kinetic energy transferred to the cabin from road imperfections such as bumps, the driver will experience much less bobbing and the passengers will also enjoy a smoother ride. In addition, suspension systems can help increase the life and durability of the car. The vehicle’s components are subjected to much less stress over time by limiting the energy transferred from bumps and potholes in the road. Therefore, the other components of the car will last longer.

The suspension works on the principle of force dissipation which involves converting force into heat thus removing the impact that force would have made. It uses springs, dampers, and struts to achieve this. A spring will hold the energy while a damper will convert it into heat. If a road were perfectly flat, with no irregularities, suspensions wouldn’t be necessary. But roads are far from flat. Even freshly paved highways have subtle imperfections that can interact with the wheels of a car. These imperfections apply forces to the wheels. According to Newton’s laws of motion, all forces have both magnitude and direction. A bump in the road causes the wheel to move up and down perpendicular to the road surface. The magnitude, of course, depends on whether the wheel is striking a giant bump or a tiny speck. Either way, the car wheel experiences a vertical acceleration as it passes over an imperfection. Without an intervening structure, all of the wheel’s vertical energy is transferred to the frame, which moves in the same direction. In such a situation, the wheels can lose contact with the road completely. Then, under the downward force of gravity, the wheels can slam back into the road surface. So, a car needs a system that will absorb the energy of the vertically accelerated wheel, allowing the frame and body to ride undisturbed while the wheels follow bumps in the road.

The suspension system on a vehicle consists of wheels, coil springs, shock absorbers, rods, linkages, joints, bearings, and bushings.

The wheels are the only part of the suspension system that touches the ground. The coil springs absorb the impact when a vehicle hits a bump in the road. The shock absorbers are sometimes called the shocks or dampers. They support the coil spring to further reduce the impact of a bump or pothole. The rods and linkages work together to link different parts of the suspension system together. The joints, bearings and bushings allow certain components of the suspension system to make sliding actions. Some vehicles do not have shock absorbers. Instead, these vehicles come with struts. A strut is similar to a shock absorber, as it provides support for the suspension as well as the coil springs.

The steering system is also important as it works with the entire suspension system to make the car turn. The entire suspension system sits on top of the vehicle's frame, which carries the weight of the vehicle.

Your car communicates when it needs attention. Some common signs that your suspension system needs a little TLC are: continued bouncing after hitting bumps or a dipping when braking; a drifting or pulling to one side when turning corners; one side of the parked car sitting lower than the other side; difficult steering and unusually bumpy rides. Bouncing and 'nosediving' likely indicates worn shocks. Pulling to one side could be as simple as a soft tire or the need for a wheel alignment or it could signify that some of the suspension components are wearing out. If your car looks uneven when on level ground with one side dipping, it could mean something in the suspension system has been damaged. Steering difficulties and rougher than normal rides are indicators of system issues.

Most car owner manuals suggest the average life of struts and other suspension system parts is around 70,000 miles depending on the driver and the roads. Replacing a suspension system typically costs between $1,000 to $5,000, but the price can vary depending on the type of vehicle, price of replacement parts, and the complexity of the replacement.

Exercise 4. Answer the questions.

1. What is a suspension?
2. What is a suspension system of a motor vehicle divided into?
3. Why does any modern car need the suspension system?
4. How does the suspension work?
5. What are the components of the suspension system on a vehicle?
6. What is each component used for?
7. What signs warn a driver about troubles in the suspension system?
8. How long is the operational life of the suspension system parts?
9. How much does it cost to replace the suspension system?

Exercise 5. Match the words (1-7) with their definitions (a-g).

1. a shock absorber	a. is a large hole in the surface of a road, caused by traffic and bad weather
2. kinetic energy	b. is a raised, uneven part on a road
3. a bump	c. having a lot of bumps
4. a vehicle's suspension	d. a device for absorbing jolts and vibrations, especially on a vehicle
5. bumpy	e. is a book which tells you how to do something or how a piece of machinery works
6. a manual	f. the energy that is produced when something moves
7. a pothole	g. a system consisting of the springs and other devices attached to the wheels, which give a smooth ride over uneven ground

Exercise 6. Complete the sentences with the words given in the box.

Potholes, damage, rear, shock, suspension, uneven, tires

1. The car suspension helps the … stay in contact with the road by increasing tire friction. 2. The job of a car … is to provide steering stability with good handling and ensure the comfort of the passengers. 3. The suspension protects the vehicle and its cargo from … and wear. 4. The design of the front and … suspensions in a car can be different. 5. A bumpy journey is uncomfortable and rough, usually because you are travelling over an … surface. 6. A … absorber is a device fitted near the wheels of a car or other vehicle to reduce the effects of travelling over uneven ground. 7. The car suspension can handle small rocks, various bumps and even big … on the road.

Exercise 7. Work in pairs. Read and translate a dialogue between two drivers. Act it out.

Information source: https://www.engineeringchoice.com/what-is-suspension-in-a-car-and-how-does-it-work/

Driver 1: I noticed that my car 'drifts' when I'm turning. What may cause that?

Driver 2: Most probably, there's something wrong with the shock absorbers.

D. 1: The shocks… hmm… I've heard that the bounce test is the easiest way to check the shock absorbers.

D. 2: Yeah, that's right. Anyone can do it. You should simply push your entire weight down on your car's bonnet. Release and count the number of times the car bounces. If it bounces more than three times, then there is a problem with your shock absorbers or struts.

D. 1: And how often must the shocks and struts be replaced?

D. 2: Well, they have a specific maintenance schedule. Auto repair experts say that generally they should be replaced between every 50,000 to 100,000 miles, depending on how much wear and tear they have received.

D. 1: I see. And do you happen to know how much it costs to repair the shocks?

D. 2: Yes, I do. I replaced them last week. I went to the local service center and paid about $900. The average total cost to replace a pair of shocks is about $250 to $580. An individual shock absorber costs around $50 to $140. A couple of hours of labor to do the job is an additional $150 to $300.

D. 1: Thanks a lot.

D. 2: You're welcome!

Exercise 8. Look through Unit 21 again. Make a list of the words and word combinations you consider to be the terms. Translate them into Russian.

Unit 22. TYPES OF CAR SUSPENSIONS

Exercise 1. Read and memorize the words and word combinations.

1. suspension подвеска
2. frame каркас
3. terrain местность
4. springs пружины
5. shock absorber амортизатор
6. axle мост; ось
7. bounce прыжок
8. pitch наклон

9. roll крен
10. sway раскачивание; качание
11. strain деформация; напряжение; нагрузка
12. body корпус; кузов
13. independent suspension независимая подвеска
14. rigid suspension жёсткая подвеска
15. leaf spring пластинчатая пружина; листовая рессора
16. multilink suspension многошарнирная/многорычажная подвеска
17. axle suspension зависимая подвеска
18. air suspension пневматическая подвеска
19. McPherson suspension подвеска МакФерсона
20. double wishbone suspension независимая подвеска на сдвоенных параллельных А-образных рычагах
21. McPherson strut стойка МакФерсона
22. like аналогичный, подобный, похожий, сходный
23. beam axle неразрезной мост; неразрезная ось
24. coil(ed) spring винтовая пружина
25. damper демпфер; амортизатор
26. bundle пачка; набор; комплект
27. spring material пружинный материал
28. alter менять, изменять, переделывать
29. handling управление
30. assembly комплект; узел; сборка
31. rear wheel заднее колесо
32. tire grip сцепление шины с дорогой
33. intricate запутанный, сложный, замысловатый
34. high-end мощный, высококачественный; высокого класса; с широкими функциональными возможностями
35. necessitate делать необходимым; неизбежно влечь за собой
36. wheel spindle ось колеса
37. stiff жёсткий, негибкий
38. sturdy прочный, крепкий
39. load-carrying capability грузоподъёмность
40. articulation шарнирное соединение, сочленение
41. heavy-duty vehicle автомобиль для тяжёлых условий эксплуатации
42. off-roader автомобиль повышенной проходимости
43. cornering движение на повороте
44. air spring пневматическая рессора
45. air bellows пневматическая опора, пневматический упругий элемент
46. ride height высота расположения кузова легкового автомобиля
47. load-bearing несущий нагрузку
48. steering knuckle pivot шкворень поворотного кулака
49. steering knuckle поворотный кулак; поворотная цапфа
50. support опора
51. track control arm поперечная тяга подвески
52. control arm рычаг управления; рулевая тяга
53. lockstep строгий порядок; жёсткая связка
54. pivot закреплять
55. rear axle задняя ось; задний мост

56. bent гнутый; изогнутый
57. impair ухудшать
58. A-shaped arm А-образный рычаг
59. wishbone дужка (грудная кость птицы); поперечный треугольный рычаг независимой подвески (автомобиля)
60. tight/sharp corner крутой поворот
61. agility быстроходность; маневренность; поворачиваемость
62. tire grip сцепление шины с дорогой
63. rock качаться, колебаться; трястись
64. stiff жёсткий
65. road stability устойчивость при движении

Exercise 2. Read the international words and guess their meanings.

Comfortably, period, absorb, modern, system, react, type, automatically, breeze, shock, protect, manner, brand, result, control, technique, construction, material, press, commercial, designed, automobile chassis, assembly, perpendicular, configuration, fix, modified versions, compressor, sports automobiles, adaptable, combined, computer, passenger, American automotive engineer, form, situations, effective, variations, stability, comfort, damper, typically, risk, motorbike.

Exercise 3. Read and translate Text 1.

Text 1. Common Types of Vehicle Suspension Systems

Source: https://studentlesson.com/types-of-suspension-system/

Have you ever wondered why you can sit comfortably in your car for long periods? You might think of seats; yes, automobile seats do have a part, but not as much as your vehicle's suspension. Yes, your car's suspension absorbs the impact of bumps before they strike the frame giving you a smooth ride. Furthermore, modern suspension systems can react to the type of terrain and automatically set themselves to make the bumpy road a breeze.

The vehicle's chassis is connected to the front and rear wheels by springs, shock absorbers, and axles. A suspension system refers to all parts that work together to protect parts from shocks. Springs connect the automotive chassis to the axles in an indirect manner. It is done to protect the body of the vehicle from road shocks caused by bounce, pitch, roll, or sway. These road shocks make a ride bumpy and put additional strain on the car's frame and body.

Suspension systems vary by vehicle body type and, in certain cases, even by brand. The eight most common vehicle suspensions are an independent suspension, a rigid suspension or leaf spring, a multilink suspension, a rigid axle suspension, an air suspension system, a McPherson suspension, a trailing arm suspension, and a double wishbone suspension.

The ***independent suspension*** refers to a suspension system that is installed on each wheel separately. This means that bumps encountered by one wheel are unaffected by those experienced by the others. As a result, the ride and control are extremely comfortable. The McPherson strut, double wishbone suspension and multilink suspension are some of the suspensions that use this technique.

The ***rigid suspension or leaf spring***, like the beam axle suspension in construction, uses leaf springs instead of coil springs to act as dampers. Leaf springs are large bundles of spring material, mostly steel, that flex as the vehicle's axle is pressed on them. Leaf

springs are perfect for use in commercial vehicles since they can support a lot of weight without breaking. However, they are not designed for comfort, high speed, or fast turning, and if used under those conditions, the suspension will alter vehicle handling.

The ***multilink suspension*** features several links connecting to the automobile chassis and wheel assembly, as the name implies. Because these many links can respond to any force applied to them, they're also employed in off-road vehicles. On the rear wheels, multilink suspension systems are used to provide a highly comfortable ride and good tire grip. This suspension will keep your wheels attached to the ground in the event of a rapid turn. Due to their intricate construction, these suspensions are only found on high-end vehicles, and any damage necessitates a time-consuming and costly repair.

The ***rigid axle suspension***, also known as beam axle suspension, has a perpendicular axle that is attached to the wheels by a wheel spindle and can be used with leaf springs or coiled springs. A stiff axle is extremely sturdy and capable of carrying a significant amount of weight. The rigid axle suspension, unlike most current suspensions, has a very simple configuration that makes it straightforward to fix and replace. Because of its load-carrying capability and improved articulation, this suspension and its modified versions are employed in heavy-duty vehicles and off-roaders. However, these suspensions are not designed for fast speeds or sharp turns, and if subjected to heavy cornering, the car will rollover.

The ***air suspension system***, often known as air springs, is a type of suspension that uses air bellows instead of coils and dampers. These air bellows can be inflated and deflated with the help of an air compressor to alter the vehicle's ride height. Air suspension is one of the most comfortable and load-bearing suspensions available, that is why it is found in the majority of high-end luxury and sports automobiles. Many vehicles and buses utilize them because of their weight carrying capabilities. Air suspensions are extremely adaptable, and when combined with an onboard computer, they can adjust to any height, load, or passenger.

The ***McPherson strut or suspension***, invented by American automotive engineer Earle McPherson, is one of the most extensively used suspension systems in automobiles because of its simple form and ability to give comfort, control, and little space consumption. As it has a steering knuckle pivot, it is used in the front suspension. The suspension consists of a damper, a steering knuckle with two supports, and a track control arm. The knuckle's top support connects to the damper, while the lower one connects to the control arm, allowing the chassis and wheel to move in lockstep. The suspension can be adjusted to fit a wide range of cars and driving situations.

The ***trailing arm suspension*** consists of a steel arm with one end pivoted to the vehicle's chassis and the other end to the rear axle, as well as a damper. A trailing arm suspension, which is typically found on the back of a vehicle, cannot be used on heavy-duty vehicles due to the risk of the arm becoming bent, which would impair handling. The rear wheel of a motorbike is the most common example of a trailing arm suspension.

The ***double wishbone suspension*** is one of the most advanced suspensions ever created, as well as the most effective in smoothing out road bumps. Two A-shaped arms that resemble wishbones make up the double-wishbone suspension. Only independent suspensions have this configuration, which provides more control and comfort even at high speeds and in tight corners. The double wishbone suspension and its modified variations are used in luxury cars, sports cars, and race cars because of their agility, stability, and comfort.

Exercise 4. Answer the questions.

1. Which system in a vehicle is responsible for a smooth ride?
2. What are the most common types of the vehicle suspension systems?
3. What is an independent suspension system like?
4. What does a rigid suspension consist of?
5. Why are leaf springs ideal for commercial vehicles?
6. What do you know about a multilink suspension?
7. Why is the multilink suspension used on high-end vehicles?
8. What is a rigid axle suspension like?
9. What is a distinguishing feature of the rigid axle suspension?
9. What types of vehicles have the rigid axle suspension?
10. What is the construction of an air suspension system?
11. What types of vehicles have the air suspension system?
12. What can the air suspension system adjust to?
13. Why is a McPherson suspension regarded as one of the most extensively used suspension systems in cars?
14. What does the McPherson suspension consist of?
15. What does a trailing arm suspension include?
16. Why is the trailing arm suspension unsuitable for heavy-duty vehicles?
17. How is one of the most advanced suspensions called?
18. Why is a double wishbone suspension used in luxury, sports and race cars?

Exercise 5. Match the suspension types (1-8) with their descriptions (a-h).

Information source: https://www.engineeringchoice.com/what-is-suspension-in-a-car-and-how-does-it-work/

1. an independent suspension	a. This type of the suspension has a fairly complicated construction design. If this suspension is damaged, the replacement process takes a long time. The spare parts are rare, so the price of a repair or replacement is extremely high.
2. a rigid suspension	b. This suspension was invented by Earle Macpherson. Lots of cars around the world use it. Many automotive manufacturers like this suspension because it has an affordable price and also has fairly simple components. The disadvantage of this suspension is that it is less stable under heavy loads due to an improper tire grip with the asphalt when the car turns.
3. a multilink suspension	c. This type of suspension has two A-shaped arms that support the suspension system, namely the upper and lower arms. The car can run stably with this suspension. It's the most effective in providing a comfort ride.
4. a rigid axle suspension	d. This suspension has a steel arm. One end is pivoted to the chassis and the other end is fixed to the rear axle. This type of suspension is usually placed at the back of a car. It is common to use it for the rear wheel of a motorbike.
5. an air suspension system	e. This suspension has a special design and a more complex construction. It is installed on each wheel separately. The right and left wheels at the rear are not connected directly. They are joined together with the help of the axle and two flexible joints. The axle movements are mutually independent. If the left rear wheel runs over a bump, the car will

	not rock because only the left suspension moves. This type of suspension is still fairly expensive, so it is widely used in luxury cars.
6. a McPherson suspension	f. This suspension uses air bellows instead of coils and dampers. It has an excellent performance, so it is widely used in luxury and sports cars. It can be adjusted using an onboard computer.
7. a trailing arm suspension	g. This suspension is widely applied in cars in Indonesia and is mostly used in commercial-type or old-type cars. It is usually used at the rear of the car because this suspension is stiff. It has a fairly simple construction. It uses leaf springs instead of coil springs to act as dampers. Cars that use this suspension usually have a fairly high level of road stability.
8. a double wishbone suspension	h. The main feature of this suspension is its wheels which are connected into one axle. This suspension has 2 models; the first model is equipped with leaf springs, and the second one has coil springs. It is quite simple, so it can be repaired or replaced easily. It is also considered a good quality and strong suspension suitable for various types of trucks and off-road vehicles.

Exercise 6. Complete the sentences with the words given in the box.

Independent, springs, air, body, act, two, system, play, engineer, absorb, down, dampers, suspension

Information source: https://engineeringlearn.com/suspension-system-types-components/

1. The main function of the … system is to separate the vehicle body or frame from shocks and vibrations due to bad driving roads. 2. All the parts of suspension … are connected together with the help of linkages. 3. When wheels come across surface irregularities of road they move up and … and this motion causes the vibration in the body. 4. To eliminate these vibrations suspension system is placed between … and wheels. 5. Dampers are used to … the vibration and dissipate it in form of heat energy. 6. There are telescopic dampers and rocking lever … . 7. Springs … as reservoirs of energy. 8. Leaf … are also known as laminated springs because they are basically steel strips that are mounted over one another or laminated with a constant reduction in length. 9. Strut is basically the combination of a spring and a damper which is having … ends, one of which is attached to the frame and the other one to the wheel. 10. Anti-roll bars … a key role in passenger comfort and vehicle stability to improve performance. 11. As name suggests, in … rear suspension each wheel on the axle is independently move vertically up and down under the action of suspension. 12. Earle S. Mac Pherson, an … with Ford USA, developed a single wishbone with a telescopic strut-type system in 1947. 13. In the air suspension system an … spring is used instead of a mechanical spring.

Exercise 7. Work in pairs. Read and translate a dialogue between a driver and a mechanic. Act it out.

Information source: https://www.engineeringchoice.com/what-is-suspension-in-a-car-and-how-does-it-work/

Driver: What is the average life of a car suspension system?

Mechanic: It depends on the operating conditions but normally it lasts from 50,000 to 80,000 miles before repairs are required.

D.: I see. And how can I understand that I need to repair or replace the suspension on my car?

M.: That's easy. There are some typical signs of the worn suspension. For example, you may feel noticeable vibrations while driving. Or your rides are too bumpy and you can hear clunking noises when hitting a bump. Also, you can see some fluid leakages, irregular tire wear or a hovering front end of your car.

D.: So, to maintain the suspension system I need to check the tires' air and tread, get the wheels aligned, inspect the bushings, joints and shocks regularly.

M.: Exactly. And don't forget to check the power steering fluid and belt.

D.: Do you mean the car suspension can affect the steering?

M.: Yes, of course. If your car becomes hard to steer, especially at low speed, something might be wrong with the suspension. You know, your steering is linked to the suspension and the two rely on each other to get their respective jobs done.

D.: And what may happen if not to fix the failing suspension system?

M.: Well, it is not recommended. A damaged or collapsed spring can cause sagging and noises. While you can still drive, the ride will be rough and the car will be difficult to control in an emergency. Plus, bumps could damage other parts of the car. Besides, you may often feel your car 'pulls' when making turns. This basically means the shocks are no longer keeping the vehicle body stable against the centrifugal force of a turn, increasing your risk of a rollover.

D.: The rollover? Sounds awful! And how long does it usually take to fix the suspension?

M.: Well, car suspensions consist of numerous parts. So, it may take from several hours to a full day to repair.

D.: And how much does the job cost?

M.: Replacing the suspension system typically costs between $1,000 to $5,000 or more, depending on the type of system and the make, model, and year of the vehicle. The luxury vehicles usually cost more than standard automobiles.

Exercise 8. Search the Web for the suspension system components and make a presentation.

Exercise 9. Look through Unit 22 again. Make a list of the words and word combinations you consider to be the terms. Translate them into Russian.

Unit 23. TRANSMISSION SYSTEM

Exercise 1. Read and memorize the words and word combinations.

1. transmission коробка передач; передача; привод; трансмиссия
2. rev оборот двигателя
3. neutral выключенное положение (передачи)
4. clutch mechanism зажимное устройство; механизм включения сцепления
5. driving wheel ведущее колесо
6. manual/mechanical transmission механическая трансмиссия
7. automatic transmission автоматическая коробка передач; автоматическая трансмиссия
8. continuously variable transmission бесступенчатая коробка передач; вариатор; бесступенчатая трансмиссия
9. dual-clutch transmission коробка передач с двойным сцеплением
10. sequential manual transmission коробка передач с ручным последовательным переключением передач

11. semi-automatic transmission роботизированная коробка передач; полуавтоматическая трансмиссия
12. clutch pedal педаль сцепления
13. disengage выводить из зацепления, расцеплять; отсоединять; выключать; разъединять
14. gearbox коробка передач; коробка скоростей
15. depress the pedal выжимать педаль
16. engage вводить в зацепление; зацеплять; включать
17. gear lever рычаг переключения передач
18. shift переключение; переключать
19. torque converter гидротрансформатор
20. engine power мощность двигателя
21. manual mode ручной режим
22. pulley ролик; шкив
23. belt лента; ремень
24. chain цепь
25. cone конус; конический ролик
26. turns ratio коэффициент трансформации по соотношению витков
27. turn оборот; виток
28. gear ratio передаточное число передачи
29. rev/revolution range диапазон оборотов; диапазон частот вращения
30. dimensions размер, размеры
31. heavy use интенсивное использование
32. towing буксировка; использование прицепов
33. lightning-fast с особо высоким быстродействием
34. even чётный
35. odd нечётный
36. frontwheel-drive car переднеприводный легковой автомобиль
37. transversal поперечный
38. swiftness быстрота; число оборотов
39. paddle shift лепестковое переключение передач
40. skipping игнорирование; пропуск; перескакивание; переход

Exercise 2. Read the international words and guess their meanings.

Component, design, base, optimal, neutral, mechanism, history, automotive engineers, group, automatic, popular types, press the pedal, coordinate, gas, control, sport, modern technology, concept, accelerator, complex electronics, classic automatic transmission, converter, relax, practicality, start, efficiency, dominate, industry, result, mechanical, compact, passenger, ideal, scooter, machine, interesting, system, model, favorite, track, select, concentrate, companies, experiment, hybrids, basic idea, combine, comfort, mix.

Exercise 3. Read and translate Text 1.

Text 1. Main Types of Car Transmission

Source: https://lemonbin.com/types-of-car-transmission/

The transmission is one of the vital components of any vehicle with an internal combustion engine. It is a device designed to change the speed of the engine based on the amount of power needed. The transmission helps to transmit the power from the engine to the wheels in an optimal way. It also ensures that the car's engine revs are optimally used, performance is improved, and it can be put in neutral. The neutral gear uses a clutch

mechanism that disconnects the engine revs from the driving wheels.

Throughout history, automotive engineers designed and introduced numerous types of transmissions. They can be divided into two distinctive groups: automatic and manual. Automatic transmissions have evolved a lot more than manual transmissions, especially in the last few decades. The most popular types of car transmission used today are a manual transmission, an automatic transmission, a continuously variable transmission, a dual-clutch transmission, a sequential manual transmission and a semi-automatic transmission.

The ***manual transmission*** has been around since the beginning of the automotive age. In order to properly operate the vehicle, the driver is required to press the clutch pedal, disengaging the gearbox from the engine, manually choose the desired gear, and depress the clutch pedal to engage the transmission. Using the manual transmission demands a certain level of skill and coordinating your left leg (clutch), right foot (gas), and right hand (gear lever). Shifting requires coordinated movement in order to operate the car smoothly which is often quite challenging to learn. The benefits of manual transmissions are the high level of driver engagement and sense of control. Although the manuals have lesser performance and slower shifting times, they are still highly regarded as the proper transmission by some driving purists. However, with technological improvements to automatic transmissions, manual transmissions are becoming less common and can be seen in some old vehicles and sports cars.

Most modern cars have the ***automatic transmission***, a technology that has been around since the 1940's. The concept of an automatic transmission is simple. The driver puts the vehicle in 'D' (for drive), and the gearbox will execute shifting automatically. There is no clutch pedal, just the brake and the accelerator, which makes using a car with an automatic transmission much easier to operate.

The automatic gearbox is a much more complicated device than the manual, especially modern transmissions with complex electronics. The classic automatic transmission has a torque converter that replaces the clutch mechanism of manual transmission and it shifts gears smoothly without the driver's input. The benefits of the automatic transmission are a more relaxed driving experience, efficiency, and practicality. The automatic gearboxes started as 2 or 3-speed units, while modern automatic transmissions have 8-speed or even 10-speed boxes. The more gears the transmission has, the better it can use the engine power for high efficiency and performance. Modern advances have improved the shifting times in automatics and made them much quicker than the manuals could ever be. That is one of the reasons why the automatic transmission is dominating the industry right now, and it is irreplaceable for some types of vehicles like SUVs or pickup trucks. Many modern automatic transmissions also have a 'manual mode' or feature that allows the drivers to control the gearbox by choosing the desired gear themselves.

The ***continuously variable transmission*** (CVT) is an automatic transmission since it has no clutch pedal and doesn't require the driver to change gears. There are several types of the CVTs, but the most common is the pulley-based CVT which uses a V-shaped belt or chain to connect two cones; one is powered by the engine and the other cone is connected to driving wheels. When moving the cones towards and away from each other, the CVT creates a different turns ratio, which results in varying numbers of the turns of the driving wheels. That is why the CVT is often called 'gearless transmission'. It doesn't have a pre-designed set of mechanical gear ratios but a continuous set of ratios used through the rev range.

The benefits of the CVT are the optimal use of the engine power and torque (since the gearbox is always in the right ratio), compact dimensions, and lower weight. However, the CVT is rarely used in passenger vehicles since it cannot endure heavy use and towing, and it is not ideal for highway driving. The CVTs are commonly found in scooters, some

machines, and the Toyota Prius.

One of the most interesting automatic transmissions found in modern vehicles is the DCT or ***dual-clutch transmission***. This design is best known for its compact size and lightning-fast shifts, which made it popular in sports cars and high-performance vehicles. The DCT is an automatic transmission, but it features two clutches, one for even gears and the other for odd gears. The DCT does not have a torque converter like a conventional automatic transmission. It can change gears very fast since the system can swiftly use one or the other clutch pack connected with the 1-3-5 or 2-4-6 gears.

Volkswagen successfully introduced the DCT in 2003 with the Golf MK4 R32, and it has been subsequently used in many other vehicles. The DCT is lighter than an automatic transmission, which makes it easier to mount in frontwheel-drive models with transversally installed engines. It has also proven durable even for high-performance use and unbeatable in shift times, making it a favorite with the sports car drivers.

The ***sequential manual transmission*** is rarely used in passenger vehicles but it is a top choice for race car drivers. This highly sophisticated unit uses the feel and control of the manual transmission with the swiftness and precision of an automatic. It is designed for extreme race track use. Sequential manual transmissions have a clutch, but it is only used for starting and selecting the first gear. After that, the driver selects the gears by gear lever or paddle shifts. The driver can concentrate on driving while the gears are changed quickly without the need for pressing the clutch every time.

Despite the benefits, this type of transmission is not used in consumer vehicles because of the high cost. Additionally, there are no skipping gears. The sequential manual transmission can only change into the next gear up or down, not skip two or three gears like the common automatic transmission.

Over the years, numerous companies experimented with hybrids of manual and automatic gearboxes and created the ***semi-automatic transmission***. The basic idea was to combine the efficiency and control of a manual transmission with the comfort of an automatic transmission. So far, semi-automatics have had mixed success and are not commonly used in consumer cars.

Exercise 4. Answer the questions.

1. Why does a car need a transmission?
2. What are the most popular types of the car transmission?
3. What is the driver's role in a manual transmission operation?
4. What are the benefits of the manual transmissions?
5. Why is it supposed that the concept of an automatic transmission is simple?
6. Why is the automatic gearbox regarded as a much more complicated device than the manual transmission?
7. What are the benefits of the automatic transmission?
8. Why is the automatic transmission dominating the auto industry?
9. What is the most common type of a continuously variable transmission?
10. What are the benefits of the CVT?
11. What is a DCT?
12. What is the principle of operation of the DCT?
13. Why is the DCT regarded as the sports car drivers' favourite transmission?
14. What is a sequential manual transmission designed for?
15. Why is this type of transmission never used in consumer vehicles?
16. Why was a semi-automatic transmission invented?

Exercise 5. Read about the advantages and disadvantages of different types of transmission. Complete the gaps (a-l) with the words given in the box.

Frequent, non-sequentially, cost-effective, increase, repair, smoothest, economy, transmission, is, efforts, driver, compared

Information source: https://www.theengineerspost.com/types-of-transmission/

Advantages of Manual Transmission

1. The manual transmission is considered better for off-road purposes.
2. This type of a) … system provides high torque load.
3. It is much more reliable and easier to service than other types.

Disadvantages of Manual Transmission

1. Not everyone can drive a car equipped with it.
2. Higher learning curve.
3. It requires much more work and b)… during driving.

Advantages of Automatic Transmission

1. The automatic transmission is simple, convenient and easy to use.
2. It provides comfortable driving for the c) … and passengers.
3. It naturally has more power than any equivalent manual transmission.

Disadvantages of Automatic Transmission

1. It is a complex system where many different items can fail.
2. It is very expensive to maintain and d) … compared to manual transmission.

Advantages of CVT

1. It can provide the e)… ride because it eliminates feeling of shifting.
2. It has greater fuel efficiency because engine is always running efficiently.
3. It can give you a faster response to a change in driving conditions.

Disadvantages of CVT

1. It is considered unusable in off-road conditions.
2. There f)… no engine braking capability as seen in the manual transmission.

Advantages of Semi-automatic Transmission

1. It can provide a smooth shifting g) … to manual transmission.
2. It has less inefficiency in shifting means no lag time or slippage.
3. You can do gear shifting quickly without any difficulty.

Disadvantages of Semi-automatic Transmission

1. It is a complex system which means that objects are likely to fail.
2. It is expensive to maintain compared to manual transmission.
3. It is very expensive to repair; often it is more h) … just to replace it.

Advantages of Dual-clutch Transmission

1. The DCT offers better fuel i) … and better performance than the automatic transmission.
2. Since it shifts smoothly and with a high degree of accuracy, it is often preferred in the field of performance driving.

Disadvantages of Dual-clutch Transmission

1. It is expensive and extremely complex which leads to more j) … and costly repairs.
2. When driving at low speeds, such as in a parking lot or on the opposite side of the car, it tends to pull and lock.

Advantages of Sequential Transmission

1. The shifting gears in the sequential transmission are easier.

2. You can k) … or decrease your speed without stopping or experiencing a drop in speed.

3. This mechanism is called so because you can only change gears in sequence.

Disadvantages of Sequential Transmission

1. One disadvantage of a sequential gearbox is that you cannot 'skip the shift' – i.e., change gears l) … .

2. Going again after a panic stop can be a bit difficult as it does not like to shift easily while stopping.

Exercise 6. Match the terms (1-4) with their definitions (a-d).

1. transmission	a. a device that transmits or multiplies torque generated by an engine
2. gearbox	b. a gear stick that you use to change gear in a car or other vehicle
3. gear lever	c. the system of gears in an engine or vehicle
4. torque converter	d. the mechanism by which power is transmitted from an engine to the axle in a motor vehicle

Exercise 7. Match the types of vehicle transmission (1-6) with their descriptions (a-f).

Information sources: https://www.theengineerspost.com/types-of-transmission/, https://www.engineeringchoice.com/what-is-transmission-in-a-car/

1. An automatic transmission	a. This type of transmission is a system that requires the driver to select a gear manually by operating a gear stick and clutch to change gears.
2. A sequential manual transmission	b. This is a pulley-based transmission primarily used in small vehicles with smaller engines. It can change gears seamlessly through a constant gear ratio.
3. A dual-clutch transmission	c. This type of transmission allows you to select either the next gear (e.g., shifting from first gear to second gear) or the previous gear (e.g., shifting from third gear to second gear), operated through electronic pedals mounted on the rear of the steering wheel. It is used mostly for motorcycles and racing cars.
4. A manual transmission	d. This is a multi-speed transmission, where part of its operation is automatic, but requires a driver's input to drive the vehicle from stop and change gears manually. It is a combination of manual and automatic transmission.
5. A continuously variable transmission	e. It is a multi-speed transmission utilized in vehicles that do not require any driver to change forward gears under normal driving situations. This transmission automatically changes gears as the vehicle moves. Once a car is in drive, its computer takes over the transmission, shifting between gears as necessary while the car accelerates and decelerates.
6. A semi-automatic transmission	f. This transmission employs two separate clutches for odd and even gear sets which allow for especially quick shifts. The design is often similar to two separate manual transmissions, in that their respective clutches are within a housing, and operate as a single unit. This type of transmission are mainly found on race cars and high-end sports cars and they are quite expensive.

Exercise 8. Work in pairs. Read and translate a dialogue between a customer and a salesperson. Act it out.

Information source: https://www.toyota.com/car-tips/types-of-transmissions/

Salesperson: Hello! How can I help you?

Customer: I want to buy a new car.

S.: Fine! What type of transmission would you like to have?

C.: You know, I prefer the manual transmission. I find it more exciting to drive. I feel more involved. It gives me a feeling that I have my personal way to conduct my car. It's really cool.

S.: Great! We have a few choices for you to consider. To drive a manual behind the wheel of a sports car, try the Toyota 86. The 86 is light, sleek, fast, corners well, and is reasonably priced.

C.: Wow, this model looks fantastic but I enjoy off-road driving.

S.: No problem! To get the ultimate in hands-on, off-road driving, get a manual Toyota Tacoma TRD Pro and see how adept you are at managing the gears as you drive off-road.

C.: Yeah, this is what I was looking for! I like that car. Can I take it for a test drive?

S.: Yes, sure.

Exercise 9. Search the Web for other types of transmission (e.g., the intelligent manual transmission (IMT), the automated manual transmission (AMT), the torque converter transmission, the tiptronic transmission, etc.) and make a presentation about one of them.

Exercise 10. Look through Unit 23 again. Make a list of the words and word combinations you consider to be the terms. Translate them into Russian.

Unit 24. ELECTRICAL SYSTEM

Exercise 1. Read and memorize the words and word combinations.

1. electrical system электрическая сеть
2. circuit контур; схема; цепь
3. voltage вольтаж, электрическое напряжение
4. electrics электрооборудование
5. electric wiring электропроводка
6. alternator генератор переменного тока
7. electric current электрический ток
8. actuator привод; исполнительный механизм; управляющее устройство; выключатель; переключатель
9. power window электрический стеклоподъёмник
10. metal body металлический кузов
11. subsystem подсистема
12. ignition system система зажигания
13. charging system система подзарядки
14. starting system пусковая система, система пуска
15. fuel system система подачи топлива; топливная система
16. lighting system система освещения
17. electrically электрически; электрическими средствами

18. electronically электронно; при помощи электронных устройств, компьютера; на основе электроники
19. fuse предохранитель, плавкий предохранитель
20. relay реле
21. battery аккумулятор; (аккумуляторная) батарея
22. starter motor стартерный электродвигатель, стартёр
23. safety device защитное (предохранительное) устройство
24. short circuit короткое замыкание
25. predetermined заданный, предопределённый
26. current value значение тока
27. overload перегрузка; перенапряжение
28. blow плавиться (о предохранителе); перегорать
29. fuse terminal клемма предохранителя; плавкий контакт
30. encased помещенный в корпус
31. resistive material резистивный проводниковый материал
32. soldered запаянный; припаянный, спаянный
33. fuse box блок плавких предохранителей
34. aftermarket вторичный рынок дополнительной периферии, запасных частей, аксессуаров и т.п.
35. in-line fuse предохранитель проводки
36. trigger триггер; пусковая схема
37. electromagnetic switch электромагнитный выключатель
38. cooling fan охлаждающий вентилятор
39. ABS (antilock brake system) антиблокировочная тормозная система, АБС
40. horn клаксон
41. three-pin трёхконтактный, трёхштырьковый
42. low amperage circuit слаботочная цепь
43. coil circuit контур катушки; цепь катушки
44. high amperage высокая сила тока
45. DIN (Deutsche Industrie Norm) немецкий промышленный стандарт; стандарт DIN
46. pin штырь; контакт
47. electrochemical электрохимический; электролитический
48. power bank банк мощности
49. lead-acid battery свинцово-кислотная батарея
50. lead plate листовой свинец, рольный свинец
51. submerged затопленный; погружённый
52. sulfuric acid серная кислота
53. stabilizer стабилизатор
54. voltage spikes выброс напряжения; импульсные скачки напряжения
55. electromechanical device электромеханическое устройство
56. engine belt ремень двигателя/мотора
57. AC (alternating current) переменный ток
58. DC (direct current) постоянный ток
59. rectifier ректификатор; выпрямитель (тока)
60. excitation намагничивающая сила; намагничивание (током)
61. exciter wire провод возбудителя
62. non-self-exciting alternator генератор без самовозбуждения
63. excitation current ток возбуждения; ток намагничивания

64. self-starter автоматический завод, стартёр, самопуск
65. crank заводить, запускать
66. engine casing машинный кожух; кожух двигателя
67. transmission housing корпус коробки подач
68. starter motor armature якорь стартёра
69. commutator коллектор
70. brush щётка
71. pinion gear ведущая шестерня
72. overrunning clutch муфта свободного хода; муфта Бендикса; бендикс
73. field coil катушка
74. permanent magnet постоянный магнит
75. planetary gear set планетарная передача
76. solenoid соленоид, электромагнитная катушка
77. motor assembly силовой узел; силовой блок
78. electromagnetic switch электромагнитный выключатель

Exercise 2. Read the international words and guess their meanings.

Basic, function, electrical system, generate, distribute, voltage, electrical components, electrics, battery, starter, sensors, computers, sensors, radio, starter motor, metal, starting system, harmoniously, electrically, electronically, relay, principle, effect, designed, situation, metal element, plastic, resistive material, zinc, aluminum, cabin, control, trigger, electromagnetic, maximum, conditioner, types, automobile industry, amperage, standard, electrochemical device, bank, chemical form, convert into electrical form, reservoir, stabilizer, regulate, electro-mechanical device, mechanical energy, electrical energy, rectifier, transmission, armature, commutator, magnet, solenoid.

Exercise 3. Read and translate Text 1.

Text 1. Car Electrical System: Function, Subsystems and Parts

Source: https://www.easycarelectrics.com/how-car-electrical-system-works/

In the early time, most of the vehicle's circuits were simple, containing a few basic circuits such as lighting, wiper, etc. Over time the vehicle's circuits got updated, which increased its complexity.

The function of a car's electrical system is to generate, store and distribute voltage to all of the electrical components in the vehicle. The vehicle electrics is the system of electric wiring and a number of different parts, including the battery, alternator, starter, and various sensors and switches. The vehicle electrics interconnects all the car's electrical parts with each other by carrying electric current and voltage to all the parts such as various computers, sensors, actuators, motors, gauges, power windows, radio, headlights, sunroof, starter motor, and many other electrical components. All the electrical components receive voltage from the battery and return it to the battery through the car's metal body.

The car's electrical system consists of several smaller electrical subsystems such as an ignition system, a charging system, a starting system, a fuel system, a lighting system, etc., which work together harmoniously. In all electrical subsystems, one thing is a must, and that is the need for voltage.

Every part in a vehicle that operates electrically or electronically is called a vehicle electrical system's part. A car's electrical system has hundreds of electrical and electronic parts. The major car electrical system parts are a fuse, a relay, a battery, an alternator and a starter motor.

The ***fuse*** is the most essential part of the car's electrical system. It is a safety device used to protect electrical wiring from damage in the event of a short circuit. A fuse kills itself when the current exceeds its predetermined current value. Ideally, every electrical circuit in a car should have a fuse to protect the circuit from damage in an overload event. The fuse's working principle is based on the heating effect of the current. It is designed to blow into an overload situation and break the connection. A fuse contains a metal element and two terminals encased by a plastic housing body. The metal element is a resistive material made from zinc, copper, or aluminum, which produces heat when the current flows through it. When the current exceeds its predetermined current value, too much heat is produced in the fuse element, which causes the fuse to blow. The fuse element is soldered to the fuse terminals. Fuses are located in the fuse box inside the cabin or outside the engine compartment. Some aftermarket circuits use an inline fuse.

The ***relay*** is a very important car electrical system part. It can control many electrical circuits with a single trigger. A relay is an electromagnetic switch used to connect and disconnect the electrical circuit. It is mostly used in heavy circuits, which consume a tremendous amount of current. The relay controls a large amount of current by using a small amount of current to avoid a load on the wire. The engine cooling fan uses a relay to provide a high amount of current to the cooling fan for maximum cooling. The car air conditioner, ABS motor, headlight, starter motor, horn, etc. use a relay in the same way. Relays are fitted alongside fuses in the fuse box. Usually, there are three types of relays used in the automobile industry; they are the three-pin, four-pin, and five-pin relays. The four and five-pin relays are the most common in a vehicle. A relay has two circuits, a low amperage circuit (coil circuit) and high amperage circuit. Moreover, the pins of a relay are numbered 85, 86, 30, 87, and 87a according to the DIN standard. Pins number 85 and 86 are considered low amperage circuit (coil circuit) pins, while 30, 87, and 87a pins are considered high amperage circuit ones.

The ***battery*** is the heart and most necessary part of a car's electrical system. It is the basic source of electricity in the car's electrical system. The battery provides electric current through the wires to all the electrical components. The battery is an electrochemical device and a power bank, which stores the electrical current in chemical form and converts it into electrical (electric current) form when required. With the engine OFF, the battery provides the current to all the electrical circuits, including the ignition and starting circuit to start the engine. And when the engine starts, then the alternator supplies the current to all the electrical circuits. The lead-acid battery is one of the most common batteries in the car. It contains lead (Pb) plates submerged in sulfuric acid (H2SO4). The battery acts as a reservoir when the current demand is higher than the alternator produces, the battery provides additional current to the electrical circuits. Similarly, the battery acts as a stabilizer, it regulates damaging voltage spikes when the engine is running.

The ***alternator*** is one of the essential parts of the car's electrical system. The alternator is an electro-mechanical device, which converts mechanical energy into electrical energy driven by the engine belt. The alternators produce AC that is converted to DC by a rectifier. The alternator provides electrical power to the car's electrical system and battery while the engine is running. It initially needs the current to start producing the electric current. This initial current is known as excitation, in which the alternator is excited by the battery ignition switch through the exciter wire. The type of alternator, which needs an excitation from the battery to start producing electric current, is called a non-self-exciting alternator. Some alternators do not need an excitation current; those types of alternators are called self-exciting alternators. A fully charged battery gives almost 12.6 volts (with the engine off), and a good working alternator produces almost 14 to 14.6 volts.

The ***starter motor*** is an electrical component of the car's electrical system that helps in starting the car. The starter motor, also called a starter or self-starter, is a device used to crank the engine. It converts electrical energy into mechanical energy in an internal-combustion engine. It is mounted on the back of the engine casing or in front of the transmission housing. The starter motor consists of several parts such as an armature, a commutator, brushes, a pinion gear, an overrunning clutch, a field coil or a permanent magnet, and a planetary gear set. All these parts get combined, creating the starter motor. A solenoid fits on the starter motor assembly, which acts as an electromagnetic switch. The solenoid connects and disconnects the battery to the starter motor.

Exercise 4. Answer the questions.

1. What is the function of a car's electrical system?
2. What is a vehicle electrics?
3. What car parts does the vehicle electrics interconnect?
4. What smaller electrical subsystems can you name?
5. What vehicle electrical and electronic parts do you know?
6. What is a fuse?
7. How does the fuse function?
8. What is a relay?
9. How does the relay work?
10. What types of relays are used in cars?
11. What is a battery?
12. What role does the battery play in the car's electrical system?
13. What is an alternator?
14. What is the principle of operation of alternators?
15. What is a starter motor?
16. What does the starter motor do?
17. What parts does the starter motor consist of?

Exercise 5. Match the electrical subsystems (1-4) with their descriptions (a-d).

1. The ignition system	a. This system provides electricity to your car's electrical system. It provides the current to your car's electrical systems and components such as starting system, ignitions system, fuel system, lighting system, radio, air conditioner, washer pump, etc. The alternator is the main component of this system. It supplies the charge to the battery and accessories. The battery stores the electrical current and initially provides the current to the car's electrical system when the engine is OFF. As the engine has been started, and the alternator starts to produce the electrical current, then the current starts to flow from the alternator to the car's electrical system.
2. The charging system	b. This subsystem is an electrical system that provides fuel to the engine cylinder. In the past, this system was mechanical – a mechanical fuel pump was used to send the fuel to the engine cylinder. Due to advancements in technology, this system started to operate electrically. The fuel tank stores the fuel that is pumped by the fuel pump through fuel pipelines to the engine cylinder. This system consists of a fuel pump, a fuel filter, an inertia safety switch, a fuse, and a relay.
3. The starting system	c. This is one of the electrical systems which function is to provide a continuous spark to the spark plug in the compression stroke of the gasoline engine cylinders. Its job is to ignite the air-fuel mixture in a gasoline en-

	gine cylinder. This system consists of many components such as ignition coils, spark plugs, batteries, fuse, and relay. The ignition coil converts the normal battery voltage to a high-voltage pulse that goes into the engine cylinder to ignite the air-fuel mixture.
4. The fuel system	d. This subsystem is an electrical system that works on the principle of converting electrical energy into mechanical energy. In the early days, the car was used to start with a mechanical hand crank. Later in 1912, the electrical version of this system was introduced to start the car. The function of this system is to provide an engine start. The starter motor is the main basic component in the system. It uses electrical energy and converts it into rotational energy.

Exercise 6. Work in pairs. Read and translate a dialogue between a customer and a salesman. Act it out.

Salesman: Hello! How can I help you?

Customer: Hi! I need to replace a fuse.

S.: This way, please. We have got a large selection of fuses in our shop. I think the best one in our city. Do you need a blade fuse or a tubular one?

C.: Hmm… I have no idea how it's called. But it's plastic with two metal blades.

S.: I see. Do you happen to have your burned-out fuse with you?

C.: Yes, I do. Here it is.

S.: Fine. Let's compare it with the ones we have. I guess, this one will be the right replacement.

C.: Thank you! Where's the cash desk?

S.: It's over there.

Exercise 7. Search the Web for a car electrical wiring and make a presentation about it.

Exercise 8. Look through Unit 24 again. Make a list of the words and word combinations you consider to be the terms. Translate them into Russian.

Unit 25. CAR'S BASIC ELECTRICAL TERMINOLOGY

Exercise 1. Read and memorize the words and word combinations.

1. particle of matter элементарная частица
2. negative electrical charge отрицательно заряженный
3. flow of electrons поток электронов
4. current ток
5. electrical circuit электрическая схема
6. flow поток; движение; течь; передвигаться; перемещаться
7. power source источник питания
8. load нагрузка сети электропитания (компонент электрической сети, рассеивающий мощность, забирающий у неё часть энергии)
9. light illumination освещение
10. negative terminal отрицательный вывод, полюс аккумуляторной батареи; отрицательная клемма
11. ampere ампер, А в системе СИ – единица измерения силы электрического тока (6,25 x 10^{18} электронов в секунду), названа в честь французского физика Андре Мари Ампера

12. coulomb (C) кулон, Кл в системе СИ – единица измерения величины электрического заряда (количества электричества, unit of electrical charge), равная 6,25 x 10^{18} электронов, названа в честь французского инженера и физика Чарльза Кулона

13. direct current (DC) постоянный ток

14. go in unidirectional перемещаться только в одном направлении

15. polarity полярность

16. positive pole положительный полюс

17. negative pole отрицательный полюс

18. alternating current (AC) переменный ток

19. flow in the opposite direction изменить своё направление на противоположное

20. voltage вольтаж, электрическое напряжение

21. electromotive force электродвижущая сила

22. in a fraction of a second за долю секунды

23. positive terminal положительный вывод, полюс аккумуляторной батареи; положительная клемма

24. unit единица измерения

25. volt (V) вольт, В – единица измерения электродвижущей силы, названа в честь итальянского учёного Александра Вольта

26. joule (J, j) джоуль, Дж в системе единиц СИ – единица измерения энергии, работы и количества теплоты, эквивалентная 1 ватт/с

27. potential difference разность потенциалов

28. ignition coil катушка зажигания

29. electrical resistance электрическое сопротивление

30. material property свойство материала

31. ohm Ом – единица измерения электрического сопротивления, названа в честь Георга Ома

32. ohmmeter омметр (прибор для измерения электрического сопротивления)

33. multimeter авометр, ампервольтомметр, мультиметр

34. insulator изолятор (материал, плохо проводящий электрический ток, т.е. обладающий очень высоким электрическим сопротивлением)

35. current flow электрический ток

36. cross-sectional area площадь поперечного сечения

37. connector соединительный элемент; соединитель; разъём

38. pin terminal штырьковый вывод

39. round rod круглый стержень

40. battery plate аккумуляторная пластина

41. electrical polarity электрическая полярность

42. electrical potential электрический потенциал

43. electric current электрический ток

44. conventional current flow условный электрический ток (поток положительных зарядов от узла с положительным потенциалом к узлу с отрицательным потенциалом, то есть в противоположном направлении по отношению к реальному току)

45. power source источник питания

46. earth заземление, ‘земля’

47. post клемма

48. live wire провод под напряжением

49. light bulb (электрическая) лампочка

50. switch выключатель; прерыватель, коммутатор

51. hot wire фазный (фазовый) провод, провод фазы

52. earthing wire провод заземления, заземляющий провод
53. conductor проводник
54. electric shock электрический удар, поражение электрическим током
55. tungsten вольфрам
56. solid metal твёрдый металл; цельнометаллический
57. molded изготовленный в форме

Exercise 2. Read the international words and guess their meanings.

Terminology, definition, basic, electron, atom, negative, symbol, energy, battery, positive, illumination, metal, ampere, polarity, automobile industry, electrochemically, voltage, electrical pressure, billions, second, joule, volt, electric, potential energy, electrical systems, components, 12-volt system, accessories, sensors, hybrid, electrical resistance, material, ohm, Greek, Omega, ohmmeter, multimeter, plastic, minimal, factors, temperature, corrosion, corroded, electrical potential, diameter, chassis, activate, deactivate, lamp.

Exercise 3. Read and translate Text 1.

Text 1. The Car's Basic Electrical Terminology and Definitions

Source: https://www.easycarelectrics.com/how-car-electrical-system-works/

An ***electron*** is a tiny particle of matter that is smaller than an atom and has a negative electrical charge. The flow of electrons is called a ***current***. The current is the basics of an electrical circuit. Without it the electrical circuit doesn't work. The symbol of the current is the uppercase letter 'I'. The electrons carry energy which they utilize in the circuit. When the electrons flow from the battery's positive power source to a load of supposing bulb, the electrons lose energy in the form of light illumination in the bulb. And the energy-less electrons go back to the battery's negative terminal through the metal frame.

An ***ampere*** or ***amp*** is the unit for measuring the electrical current. One ampere is equal to one ***coulomb***. You need to know that one coulomb is equal to 6.25 x 10^{18} electrons.

There are two types of currents – a direct current and an alternating current. A ***direct current*** or DC is a current which goes in unidirectional in a circuit. It does not change its polarity. In an automobile, the direct current goes from the battery's positive pole to the negative pole. Its polarity remains the same throughout the circuit. The DC occurs when there are more electrons on one pole and fewer electrons on another pole. It is mostly used in the automobile industry. It can be stored electrochemically in batteries.

An AC or ***alternating current*** is a current which changes its polarity in a circuit. The AC flows in one direction and then in the opposite direction when the polarity is reversed. The AC current is not common in the automobile industry.

A ***voltage*** is an electrical pressure (electromotive force) that pushes electrons around the circuit. This force is created by the difference between the quantity of positive and negative electrons on the battery's negative and positive poles. There are billions of billions of electrons flowing from the battery's negative pole to the positive pole in a fraction of a second. This difference between both poles pushes the electrons from the battery's negative terminals to the positive terminal. The more the difference is, the higher the pressure (voltage) is. The unit of voltage is ***volt***. 1 volt equals 1 joule/coulomb. The ***joule*** is the unit of energy. The coulomb is the unit of current. So, one volt means that every coulomb of charge can carry 1 joule of electric potential energy from the battery positive terminal to the battery negative terminal. The voltage is also called a ***potential difference***. It means the difference in the amount of energy the charge can potentially carry from the battery positive terminal to the battery negative terminal.

Most cars' electrical systems and their components run on a 12-volt system, such as lighting systems, power windows, and other accessories. Many vehicles' sensors use 5-volt voltage while the ignition coil uses high voltage almost from 5,000 to 30,000 volts to fire the spark plugs. Some vehicles, especially military trucks use the 24-volt system, while newer cars have an additional 48-volt power system. Hybrid vehicles use a voltage of 140 to 300 volts.

An ***electrical resistance*** or resistance is a material property to resist the flow of current in a circuit. Its unit is Ohm described by the Greek word Omega (Ω). It is measured by an ohmmeter or a multimeter having the function of an ohm checking. All the circuits have some degree of resistance. The materials with a high level of resistance such as rubber, glass, plastic, etc. are called ***insulators***. The current flow in insulators is minimal. On the contrary, the current flow is high in such materials as copper, silver, and gold due to their low level of resistance.

Such factors as temperature, length, corrosion, and size affect the resistance of a wire while the current is flowing in it. The electrical resistance of a wire increases with an increase in temperature, and vice versa. Similarly, the resistance of a wire would be higher for a longer wire, and lesser for a wire of a larger cross-sectional area. As to corrosion, a component may not work or may work randomly just because the connectors or pin terminals were corroded.

A ***pole*** means a round rod of metal placed at the end of the battery plate. There are two types of poles in a car battery – a positive pole and a negative one.

A ***polarity*** or an ***electrical polarity*** is used to represent the electrical potential at the end of the battery. In batteries, one pole has more electrons than the other one. The pole with more electrons has a negative polarity. The pole with fewer electrons has a positive polarity. When a circuit is closed, the two poles are connected by a wire, electrons flow from the negative pole toward the positive pole in one direction. This flow of electrons is called an ***electric current***. Although electrons flow from the negative pole to the positive pole, keep in mind that we assume that the electrons flow from the battery positive pole to the battery negative pole. This is called ***conventional current flow***. In cars, the battery's positive polarity is considered a hot power source, and the battery's negative polarity is considered earth. The battery positive pole is marked (+), which has a larger diameter post, and a negative pole is marked (-) and has a smaller diameter post. In a modern car, the battery negative pole is connected to the chassis and engine, which is called the earth, and the positive pole provides live wire to components. But in older cars, the polarity was opposite where the battery positive pole was connected to the chassis and engine, and the negative pole was the live wire connected to the components.

An ***electrical circuit*** is a closed route or path that allows the current to flow from the battery positive pole to the battery negative pole. A fully functioning circuit contains a power source (a battery), a load (a light bulb), and wires. The switch is used to activate and deactivate the electrical circuit. One wire goes from the battery positive power source to the load. This wire is called a ***hot wire***. The second wire goes from the load back to the battery negative power source. This wire is called an ***earth wire***. You can use the switch on any wire (a hot wire or an earth one) in the circuit. Some switches in the vehicle can be installed on the hot wires (e.g., windscreen wipers). But usually, the switches are installed on earth wires (e.g., headlights, horns, etc.). A simple form of the car electrical circuit is a headlight circuit, in which the current flows from the battery positive terminal to the component where it brightens the lamp, then the current returns back to the battery negative terminal through the earth wire.

Exercise 4. Answer the questions.

1. What does the term ‘an electron’ mean?
2. What is a definition for the term ‘a current’?
3. What is an ampere?
4. What are the two types of currents?
5. How can you define a direct current or DC?
6. What is the meaning of an AC or alternating current?
7. Which type of current is common in the automobile industry?
8. What is a voltage?
9. What is the unit of the voltage?
10. How many joules/coulombs are there in 1 volt?
11. What is a joule?
12. What is a coulomb?
13. Why is the voltage called a potential difference?
14. What is an electrical resistance?
15. What is the unit of the resistance?
16. What can be measured by an ohmmeter or a multimeter?
17. How do we call the materials with a high level of resistance?
18. What materials in cars have a low level of resistance?
19. Which factors affect the resistance of a wire?
20. What does a pole mean?
21. How many poles are there in a car battery?
22. What is a polarity?
23. What is an electrical circuit?
24. What is a hot wire?
25. What is an earth wire?

Exercise 5. Match the words (1-6) with their definitions (a-f).

1. A direct current	a. It’s a unit used for measuring electric current; it’s equal to a flow of one coulomb per second
2. An electrical circuit	b. It’s an electromotive force or potential difference expressed in volts
3. An ampere	c. It’s a complete route which an electric current can flow around
4. A resistance	d. It’s a substance that electricity can pass through or along
5. A conductor	e. In electrical engineering or physics, it’s the ability of a substance or an electrical circuit to stop the flow of an electrical current through it
6. The voltage	f. It’s an electric current that always flows in the same direction

Exercise 6. Read about the resistance in materials and complete the gaps (1-6) with the words given in the box.

Conduct, atom, shields, composed, insulator, conductor

Information source: https://www.easycarelectrics.com/how-car-electrical-system-works/

An 1) … is a material that does not allow electrons to flow or has too much resistance to an electron flow. This means that such materials do not readily 2) … electricity. Insulator materials include paper, plastic, rubber, glass, air, etc. The material around the wires is an insulator. It 3) … the wire conductor to prevent electric shock. A 4) … is a material that does not resist or has the least amount of resistance to the flow of electrons. In conductors, the electrons can easily move from one 5) … to another atom when voltage is

applied. Some best conductor materials are copper, silver, gold, aluminum, tungsten, iron, and steel. In the vehicle electrical systems, the conductors are 6) … of solid metals molded into wires.

Exercise 7. Work in pairs. Read and translate a dialogue between two students. Act it out. Then choose other terms from Text 1 and make a similar dialogue.

Student 1: We're having a test on a car electrical system terminology tomorrow. Here is a list of questions. Let's revise it together.

Student 2: Okay. The first question is about the definition of a current.

S. 1: Well. An electric current is a flow of electricity through a wire or circuit.

S. 2: Good. And now list two types of the electrical currents.

S. 1: They are a direct current and an alternating current.

S. 2: And which type of these currents always flows in the same direction?

S. 1: Hmm, well, I think that's AC.

S. 2: That's not correct. Actually, it's DC. An AC continually changes direction as it flows.

S. 1: Oh, I always confuse them! Now, it's my turn to ask the questions. The next one is about types of electrical measurements. How many do you know?

S. 2: There are three of them. They are voltage, ohm, and amp.

S. 1: Correct. What does an ohm measure?

S. 2: I know this; an ohm is used to measure electrical resistance.

S. 1: Exactly. What about an amp?

S. 2: An ampere is used for measuring electric current.

S. 1: Good. So, what is the voltage of an electrical current?

S. 2: Well, it is an electromotive force measured in volts.

S. 1: And how many joules are there in 1 volt?

S. 2: 1 volt equals 1 joule, doesn't it?

S. 1: That's correct.

Exercise 8. Search the Web for the types of electrical circuits (a parallel circuit, a series circuit, an open circuit, a closed circuit, a short circuit). Choose one of them and make a presentation about it. As an option, you may make a presentation about the electric system diagram from your car's manual.

Exercise 9. Look through Unit 25 again. Make a list of the words and word combinations you consider to be the terms. Translate them into Russian.

Unit 26. STARTING SYSTEM: COMPONENTS AND FUNCTIONS

Exercise 1. Read and memorize the words and word combinations.

1. starting system пусковая система, система пуска
2. starter motor стартерный электродвигатель, стартёр
3. working cycle рабочий цикл
4. resume возобновлять(ся), продолжать; начинать снова
5. starter стартёр (для пуска двигателя)
6. integrated control встроенный контроль; интегрированное управление
7. electronic control unit электронный блок управления
8. condition monitoring мониторинг текущего состояния
9. fault diagnosis диагностика сбоев или неисправностей

10. ignition switch замок зажигания
11. safety switch предохранительный выключатель; предохранительное реле
12. energize подавать напряжение; подавать питание
13. circuit контур; схема; цепь
14. current ток
15. control circuit управляющая цепь (цепь слабого тока)
16. heavy electric starter motor circuit цепь питания электростартёра (цепь большого тока)
17. instrument panel приборный щиток; приборная панель
18. voltage drop падение напряжения
19. terminal вывод; зажим; клемма
20. solenoid соленоид; электромагнитный переключатель
21. motor assembly силовой узел; силовой блок
22. gauge калибр; размер; толщина
23. fuse плавкий предохранитель; предохранитель
24. fuse box блок плавких предохранителей
25. heavy current ток большой силы; большой ток
26. large diameter cable провод большого сечения
27. keyless заводящийся без ключа
28. clutch pedal педаль сцепления
29. open contact разомкнутый контакт
30. closed замкнутый (контакт)
31. gear shift lever рычаг переключения передач
32. gearbox case картер коробки передач
33. ECU (Engine Control Unit) блок управления двигателем
34. earth заземление
35. cam кулачок; эксцентрик; выступ на валу
36. crankshaft position sensor датчик положения коленчатого вала
37. fuel pump топливный насос
38. electromagnetic switch электромагнитный переключатель
39. armature якорь
40. commutator коллектор
41. brush щётка
42. pinion gear ведущая шестерня
43. overrunning clutch муфта свободного хода; муфта Бендикса; бендикс
44. planetary gear set планетарная передача
45. torque крутящий момент
46. mesh зацепление; входить в зацепление; сцепление
47. engine flywheel маховик двигателя
48. crank заводить(ся)
49. flywheel ring gear зубчатый венец маховика
50. overspeeding превышение допустимой частоты вращения
51. burnout пережог; выгорание контактов

Exercise 2. Read the international words and guess their meanings.

Principle, chemical energy, electrical energy, mechanical energy, starter motor, initiate, cycle, inertia, model, starting systems based on an integrated control method, electronic control, potential, real, monitoring, diagnosis, components, starter relay, energize, cable diameter, instrument panel, voltage, solenoid, start position, start, stop, automatic

transmissions, locations, contacts, press the pedal, result, activated, park, neutral, signal, position sensor, calculate, electromagnetic, magnetism, planetary, resistance.

Exercise 3. Read and translate Text 1.

Text 1. Principle of Operation of Car Starting System

Source: https://www.easycarelectrics.com/car-starting-system-working-parts/

The ***car starting system*** is a crucial system for the car. It is based on converting the chemical energy stored in the battery into electrical and then into mechanical energy in the starter motor. The starter motor is placed on the back of the engine casing or on the transmission housing where the engine and transmission meet. It is an electro-mechanical device. The starter motor's job is to start the engine. An internal combustion (IC) engine cannot start itself. It needs external help to set the engine in motion before it can power itself. Thus, a starter motor is used to initiate the first working cycle of an IC engine. As soon as, the engine has started, then it relies on inertia from each working cycle to initiate the next working cycle, so the cycle resumes and the engine continues to start running.

The latest model cars have starting systems based on an integrated control method by the electronic control unit. Such starting systems have the potential to be used for real-time condition monitoring and fault diagnosis of vehicles.

The starting system consists of several components. They are a battery, an ignition switch, a starter relay, a starter safety switch and a starter motor.

The ***starter*** consists of a solenoid and a motor assembly. The starter is a large electric current consumer from the ***battery*** to energize the starter motor. So, the starter circuit requires a large diameter cable to carry the current. The starter cable usually becomes rusted with age and usage, which causes increases in the voltage drop and decreases the current flow to the starter motor. It is recommended to replace the cable when it is corroded as it can give problems in starting the car. Usually, cables should be replaced somewhere from 50,000 to 100,000 miles.

The starting system circuit is divided into two sub-circuits – the starter control circuit and the heavy electric starter motor circuit.

Using a large diameter cable from the instrument panel to the starter motor can increase the voltage drop and also cost. The ***starter control circuit*** goes on a long route from the instrument panel to the starter solenoid ignition switch terminal. This circuit only turns on and off the starter solenoid that acts as a bigger relay. And the solenoid further energizes and de-energizes the starter motor assembly. The starter control circuit consumes less power and has normal gauge cables. It starts from the ignition switch and goes to the starter fuse, then to the starter safety switch. Then the circuit continues from the safety switch to the starter relay in the fuse box and finally to the starter solenoid.

The second circuit is a ***heavy electric starter motor circuit*** that draws heavy current directly from the battery through a heavy current cable and is controlled by the solenoid. This circuit goes directly from the battery through a large diameter cable to the starter solenoid and then to the starter motor assembly.

When the ignition key is turned to the start position or a start/stop button is pushed in the keyless car, the current flows from the ***ignition switch*** to the starter fuse and then to the ***starter safety switch***. The automatic and manual transmissions use two different types of safety switches placed in different locations. In a manual transmission, the safety switch is located at the clutch pedal end and its contacts are open, and will only be closed when the driver presses the clutch pedal. When the pedal is pressed, the current starts to flow to the ***starter relay***, as a result, the relay is activated. On the other hand, in an automatic transmission, the park/neutral safety switch is located under the gear shift lever or at the

gearbox case. In an automatic transmission, the Engine Control Unit (ECU) sends an earth signal to the relay to energize it. The ECU will only allow an earth signal to the starter relay when it detects the safety switch in the park or in neutral. The ECU takes input from the cam or crankshaft position sensor and some other sensors and calculates them together, through which the ECU decides to send an earth signal to the starter relay and fuel pump relay. So, when the starter relay is activated, a large amount of current goes from the battery to the starter solenoid.

The ***starter solenoid*** is an electromagnetic switch, which acts as a bigger relay allowing and disallowing a large amount of current from the battery to the starter motor assembly. As the solenoid is energized, it also energizes the starter motor assembly.

The ***starter motor assembly*** consists of an armature, a commutator, brushes, a pinion gear, an overrunning clutch, and a planetary gear set. The ***commutator*** takes the current from the ***brush*** and sends it to ***the armature*** where the magnetism is created and as a result, the starter motor turns. The ***planetary gear set*** is used to increase its torque to overcome the resistance of the piston's up-down movement. As the armature starts to rotate, the ***pinion gear*** is pushed forward by the solenoid to mesh with the engine flywheel. Thus, the engine is cranked and gets started. As to the ***overrunning clutch***, it disconnects the starter motor armature from the flywheel ring gear. This is done to protect the armature from overspeeding and burnout.

Exercise 4. Answer the questions.

1. What is a car starting system based on?
2. What does a starter motor do?
3. What is the advantage of starting systems based on an integrated control method by the electronic control unit?
4. What are the components of the starting system?
5. What is a starter?
6. What kind of cable is used in a starter circuit?
7. Why is it recommended to replace the cable after 50,000 miles?
8. What are the sub-circuits of the starting system circuit?
9. How does a starter control circuit work?
10. How does a heavy electric starter motor circuit function?
11. What happens when an ignition key is turned to the start position?
12. Where is a safety switch located in cars with a manual transmission?
13. Where is a park/neutral safety switch located in cars with an automatic transmission?
14. What is the role of an Engine Control Unit?
15. What is a starter solenoid?
16. What does a starter motor assembly consist of?
17. What does each of the starter motor assembly component do?

Exercise 5. Match the components of the car starting system (1-5) with their descriptions (a-e).

Information source: https://www.easycarelectrics.com/car-starting-system-working-parts/

1. A car battery	a. This component of a car starting system is an electromagnetic switch that connects and disconnects an electrical circuit by using a small amount of current to control a large amount of current. The starter motor uses 250+ amps of current, which is a large amount of current. Such a

	huge amount of current can't be controlled directly from the ignition switch. That's why this component is used in the starting control circuit.
2. An ignition switch	b. There are two different types of this component. It is a part of the transmission range switch that prevents the starting system operation when the car is in gear (in the automatic transmission), or the clutch pedal is not pressed (in the manual transmission).
3. A starter relay	c. This is one of the starting system components. It makes and breaks all electrical circuits. It is the gateway of the electrical circuits and distributes the electrical power throughout the car where needed. This part has four basic positions (Off, Accessory, Run/ON, Start) but the newer cars have an extra built-in Lock position to lock the steering wheel.
4. A starter safety switch	d. This is an essential part of the starting system. It is mounted on the back of the engine casing or on the transmission housing where the engine and transmission meet. It is an electro-mechanical device that converts electrical energy into mechanical energy in I.C. engines. It consists of a solenoid and a motor assembly. The motor assembly consists of an armature, a commutator, a brush, a pinion gear, an overrunning clutch, etc.
5. A starter motor	e. This component is also known as a power bank. It is an electrochemical device that stores the current in a chemical form and converts it into an electrical current when needed. It is the heart of the car's electrical system and is usually placed in the engine compartment. It provides electrical current to all the circuits and components when required once the engine has started and the alternator is able to produce the current. Then the current is supplied by the alternator. This part also provides additional current when the current demand is greater than the alternator can supply.

Exercise 6. Match the five positions of the ignition switch (1-5) with their descriptions (a-e).

Information source: https://www.easycarelectrics.com/car-starting-system-working-parts/

1. A lock position	a. This is the first turn. In this position, the current is supplied to all the accessories (components) except starting and ignition system. In this position, the current is allowed only to accessories such as radios, cigarette lighters, windows, etc.
2. An off position	b. This is the position in which the key remains, once the engine has started. In this position, all the electrical systems are activated except starting system. The current is supplied to all the components including the fuel pump, fuel injectors, various sensors, ABS motors, airbag, dash lights, etc. In the vehicles equipped with a Push/Start button this position may be combined with the accessory position, so it's activated with the first push of the button.
3. An accessory position	c. This is the position in which the key is inserted but not yet turned. In this position, all the electrical circuits are off (no current flow) and the steering wheel is locked. Some cars have this position and the off position built in together in the same position.
4. A run/ON position	d. This is the last position of the key rotary ignition switch. It's a spring-loaded returnable position, which returns to the Run/ON position when

	the key is released. In this position, the current is supplied to only the starting and ignition system, and the current is cut off from all the accessories. That's why the radio, windows, and other accessories stop working while the engine is being started. It's to ensure the maximum cranking capacity of the battery.
5. A start position	e. It's the default position. In this position, all the electrical circuits are off (no current is supplied). The steering wheel is free to turn, but the key cannot be extracted.

Exercise 7. Read about the functions of the starting system components and complete the gaps (1-9) with the words given in the box.

Reservoir, safety, consists, stabilizer, functions, torque, starter, starting, switch

Information source: https://www.easycarelectrics.com/car-starting-system-working-parts/

The 1) … system works on the principle of converting electrical energy into mechanical energy. It converts the electrical energy of the battery into starting the engine. The starting system 2) … of a battery, an ignition switch, a starter relay, a starter safety switch and a starter motor. The battery in the car has four 3) … . First, it provides the current to all the circuits and components when the engine is off. Second, it acts as an electrical current 4) … . Third, it supplies extra current when the electrical requirement is higher than the alternator produces. And finally, the battery acts as a 5) … regulating potentially-damaging voltage spikes while the engine is running. The function of the ignition 6) … is to control the flow of electric current to all the electrical circuits in the car and distribute it where it is needed. The function of the 7) … relay is to control a larger current by using a smaller current. The function of the starter 8) … switch is to prevent the car from an accidental start-up with the car in the gear or clutch not depressed, as it can damage the transmission by jerking forward or backward. The function of the starter motor is to create 9) … to rotate the engine flywheel and get the car cranked.

Exercise 8. Work in pairs. Read and translate a dialogue between a new mechanic and an experienced mechanic. Act it out.

Information source: https://www.easycarelectrics.com/car-starting-system-working-parts/

Mechanic 1: May I ask you a few questions about a car battery construction?

Mechanic 2: Yeah, sure. What exactly do you want to know?

M. 1: Well, I know that there are many types of car batteries but which is the most common type?

M. 2: Hmm... I think it's the lead-acid battery. It's called so because it contains lead (Pb) plates that are submerged in a sulfuric acid (H2SO4).

M. 1: The sulfuric acid? And what is the electrolyte then?

M. 2: It's the liquid inside the battery. It's a mixture of the sulfuric acid and water. A fully charged lead-acid battery consists of 40 percent of the sulfuric acid and 60 percent of water.

M. 1: Okay. And does a car battery store electric current directly?

M. 2: Oh, no, it doesn't. No battery in the world can store electric current directly! It stores the energy in the chemical form and, when needed, it converts that chemical energy into the electrical energy. I mean the lead plate and electrolyte create a chemical reaction, which releases energy and gives us the electric voltage and current.

M. 1: Oh, I see. And is a lead-acid battery rechargeable?

M. 2: Yes, but it isn't a deep cycle rechargeable battery. I mean the battery should not be discharged more than 70 percent, which is harmful to the health of the battery and can

reduce its lifespan. By the way, keep in mind that a hydrogen gas emits while charging the battery. It's highly vulnerable to sparks and flames, so be careful while charging the battery.

M. 1: Okay. And why is the battery measured in cold cranking amps?

M. 2: To determine its ability to start the engine at cold temperatures.

M. 1: Oh, I see. You mean, in a cold climate, the chemical reaction in the battery slows down. So, it reduces the battery strength and minimizes the ability to produce maximum current.

M. 2: Exactly! That's why a good battery is considered the one, which cranks the engine for 30 seconds at 0 Fahrenheit temperature while still maintaining a voltage equal to or higher than 1.20 volts per cell or 7.2 volts for the whole battery.

M. 1: Very interesting! Thanks a lot! Now I've got a much better idea of the battery.

Exercise 9. Search the Web for more information about the components of the starting system and make a presentation about them.

Exercise 10. Look through Unit 26 again. Make a list of the words and word combinations you consider to be the terms. Translate them into Russian.

Unit 27. CAR AIR CONDITIONING, HEATING AND VENTILATION SYSTEMS

Exercise 1. Read and memorize the words and word combinations.

1. saloon салон (автомобиля)
2. air conditioning (AC) system система кондиционирования воздуха
3. heating system система подогрева
4. ventilation system система вентиляции
5. defogging устранение запотевания (стекла)
6. windscreen/windshield ветровое стекло; переднее стекло
7. severe winter суровая зима
8. distraction отвлечение внимания
9. legitimate health concern настоящая забота о здоровье
10. throughflow поток
11. mist/misting запотевание
12. duct канал; проход; воздуховод; направлять по трубе, каналу
13. entry point вход
14. heater нагреватель; нагревательный прибор; обогреватель; подогреватель; отопитель
15. grille решётка
16. bonnet капот
17. foot well углубление для ног в полу кузова
18. vent вентиляционное отверстие
19. dashboard приборная доска; панель приборов; приборный щиток; перегородка между двигателем и кабиной водителя
20. slot щелевое отверстие
21. ledge выступ; край
22. side window боковое окно
23. flap заслонка; створка
24. extract air отработавший воздух
25. water-cooled с водяным охлаждением

26. casing корпус
27. matrix решётка
28. hose шланг
29. water-heated с водяным обогревом
30. electric fan электрический вентилятор
31. stationary неподвижный
32. adjust настраивать; регулировать; устанавливать; выставлять
33. heat control регулирование подачи тепла; регулирование нагрева
34. water valve водяной кран; водяная задвижка
35. air-blending смешивание воздуха
36. temperature-controlled с регулируемой температурой
37. temperature control терморегулятор; регулятор температуры
38. air control регулирование подачи воздуха
39. knob кнопка
40. control panel приборный щиток
41. power-assisted control непрямое регулирование; управление с усилителем; регулятор с использованием вспомогательного источника энергии
42. air-cooled engine двигатель с воздушным охлаждением
43. fin ребро, пластина
44. exhaust manifold выпускной коллектор; выпускной трубопровод
45. heat-sensitive теплочувствительный, термочувствительный
46. electrically ignited с электрическим зажиганием
47. petrol-burning heat exchanger бензиновый радиатор отопителя салона
48. emit coolness охлаждать
49. compressor компрессор
50. condenser конденсатор
51. receiver/dryer осушитель
52. accumulator аккумулятор
53. thermal expansion valve терморегулирующий расширительный клапан; терморегулирующий вентиль
54. orifice tube дроссель
55. evaporator испаритель
56. refrigerant хладагент
57. circulate циркулировать по кругу; обращаться в замкнутой системе
58. closed-loop system замкнутая система
59. pressurize осуществлять нагнетание
60. gaseous газообразный
61. produce a pressure создавать давление
62. get hot разогреваться
63. high-pressure pipe магистраль высокого давления
64. front передняя часть
65. radiator радиатор системы охлаждения
66. lookalike аналог
67. state of aggregation агрегатное состояние
68. transit переходить (в другое состояние)
69. gaseous state газообразное состояние
70. liquid state жидкое состояние
71. heat removal отвод тепла
72. air stream поток воздуха (при движении автомобиля)

73. air current воздушный поток
74. forcibly принудительно
75. fan вентилятор
76. system with a climate control система с климат-контролем
77. inlet point впускное отверстие, входное отверстие
78. outlet point выпускное отверстие, выходное отверстие
79. inbound входящий; прибывающий; поступающий
80. high-pressure liquid жидкость под высоким давлением
81. contaminant загрязняющее вещество; примесь
82. dust пыль
83. dirt грязь; загрязнение
84. particle частица; крупица; кусочки
85. equalizing reservoir компенсационный резервуар
86. excess избыток; излишек, излишнее количество
87. process of the refrigerant evaporation процесс испарения хладагента
88. process of the refrigerant transition процесс перехода хладагента
89. take charge of осуществлять контроль
90. absorb heat поглощать тепло
91. evaporate испаряться
92. condensate on the surface конденсат на поверхности
93. equipped with оснащен
94. drainage system система дренажа
95. moisture влага
96. low-pressure pipe магистраль низкого

Exercise 2. Read the international words and guess their meanings.

Systems, microclimate, saloon, ventilation system, conditioning, passengers, comfortable, normal, discomfort, risky situations, functioning, comfort, detail, interior atmosphere, temperature, occupants, radiator, electric, stationary, extra ventilation, methods, control, regulate, constant temperature, mix, type, mechanically, control panel, cables, components, blend, function, compressor, accumulator, thermal, cycle, convert, process, start, gaseous, condenser, mini-radiator, aggregation, transit, transfer, model, filters, metal, expansion, reservoir, freon, monitor, calculate, absorb, condensate.

Exercise 3. Read and translate Text 1.

Text 1. Car Air Conditioning, Heating and Ventilation Systems

Sources: https://www.howacarworks.com/basics/how-car-heating-and-ventilation-systems-work, https://studentlesson.com/automobile-air-conditioning-system/, https://airconditionerlab.com/how-does-car-air-conditioning-work/

There are three systems in modern cars that provide a microclimate in a saloon. They are a ventilation system, a heating system and an air conditioning system. These systems provide a driver and passengers with a comfortable environment to travel in. They heat up the car in the winter, and they cool it down in the summer. It's normal for the windshield to fog up during the colder months, making it hard to see a road while driving. These systems can remove the fog by defogging the windshield and windows. Keeping a car cool during the warm season and keeping a car warm during severe winters ensures safer driving. Discomfort caused by heat and cold can create distractions and lead to risky situations. It means that a functioning of these systems isn't just a matter of comfort or convenience, but it's a legitimate health concern. This is particularly true for elderly drivers, drivers with children, or anyone sensitive to heat or frost.

Let's consider all three systems in detail. Modern cars have a ***ventilation system*** that provides a constant throughflow of fresh air that keeps the interior atmosphere pleasant even with all the windows shut. The incoming air can be also heated by the engine to keep the windows clear of mist and to maintain a chosen temperature inside the car. Air enters a large duct at the front of the car, placed so that when the car is moving the entry point is in a high-pressure area and air is forced in. From there it goes to the ***heater***, which warms it, if required. Another common entry point is through the grilles on top of the bonnet. Air enters the car interior through the front footwells and through vents on the dashboard. The vents can be adjusted to point at the faces of the front seat occupants. Some cars also have ducts to the rear seat area. Slots in the ledge at the bottom of the windscreen or by the front side windows allow a stream of warm air to be blown on to the glass to prevent misting. On later cars, all the entry points have flaps for opening and closing them as needed. At the rear, there are exit vents for the extract air to go outside.

In water-cooled cars, the heater casing contains a matrix like a small radiator that takes hot water from the engine through a hose. The incoming air goes through the water-heated matrix and is warmed. There is also an electric fan, which can be switched on to blow air through the system when the car is stationary, or when extra ventilation is needed. The fan can be adjusted to run at different speeds, according to the needs.

There are two methods of heat control. They are a ***water-valve heating system*** and an ***air-blending heating system***. In a heater worked by a water valve, all the air goes through the matrix. The matrix temperature is controlled by regulating the amount of hot water going through it. In an air-blending heater the matrix is at a constant temperature; the warm air from it is mixed with the cool air as temperature-controlled flaps open and close. The temperature to which the air is warmed is controlled by either a water valve or an air-blending system. The water-valve type is found mainly on earlier cars. The temperature control on the dashboard works as a tap which lets either more or less hot water through the matrix. The setting is slow to respond to change and difficult to regulate exactly. The air-blending system has a matrix that is heated constantly. The temperature control opens and closes flaps that blend the heated air with the cold air from outside. With either system there may be extra flaps to admit a separate supply of the cold air to the face vents, even when the rest of the system is supplying warm air. The air control flaps inside the heater box may be moved mechanically by sliding knobs on the control panel, which are linked to the flaps by cables. More expensive cars may have power-assisted controls worked by the vacuum in the inlet manifold acting on a diaphragm, as in a power brake servomechanism.

In cars with air-cooled engines, the air for the interior heater can be warmed by ducting it around fins on the hot exhaust manifold. The warmed air is mixed to the right temperature by an air-blending system, including a heat-sensitive valve that keeps the temperature steady and at a comfortable level for the occupants. If necessary, the air may be warmed further by an electrically ignited petrol-burning heat exchanger.

A ***car air conditioning (AC) system*** is a set of components that function together to emit coolness to a car's interior. It consists of a compressor, a condenser, a receiver/dryer or an accumulator, a thermal expansion valve or an orifice tube and an evaporator. These parts work together circulating a substance known as refrigerant through a high pressure or low pressure closed-loop system.

The process starts in the ***compressor*** which pressurizes the gaseous refrigerant (freon) by producing the pressure so that the refrigerant gets hot. After that the compressor moves the gaseous refrigerant through the high-pressure pipe to the condenser.

The ***condenser*** in the car AC system is located at the front of the radiator. It is known as a mini-radiator because it is a lookalike of a radiator. Its function is to change

the state of aggregation of the refrigerant. Thus, the refrigerant transits from its gaseous state to a liquid state in the condenser. The condenser provides heat removal. An air stream flows around the condenser, cooling the refrigerant as it passes through. If there is not enough air current, it is produced forcibly with the help of fans. The condenser transfers the cooled liquid refrigerant to the receiver/dryer or accumulator.

A vehicle can use either a ***receiver/dryer*** or an accumulator depending on its model. The receiver/dryer is used in vehicles that have a thermal expansion valve, while an accumulator is found in vehicles' systems with a climate control that use an orifice tube. The receiver has an inlet point and an outlet point. The inlet takes inbound high-pressure liquid from the condenser and sends it through a series of filters to remove such contaminants as dust, dirt, water and metal particles. Then, the refrigerant is sent to the thermal expansion valve via the outlet point.

The ***thermal expansion valve*** or the ***orifice tube*** is located between the condenser and evaporator. The thermal expansion valve controls how much refrigerant is allowed to continue through the AC system. This process reduces pressure and rapidly cools the refrigerant. The AC system with the orifice tube replaces the receiver/dryer with the accumulator. The accumulator is an equalizing reservoir that controls and monitors the amount of refrigerant that goes into the evaporator. It keeps an excess of freon. The main difference between the orifice tube and the thermal expansion valve is the type of device used to lower the refrigerant pressure. Their purpose is the same – to monitor the amount of pressure and temperature of the system and to calculate the amount of the refrigerant that can go into the evaporator with no harm. The process of the refrigerant evaporation or the process of the refrigerant transition into a gaseous state starts. Now the refrigerant is nearly ready to cool a car, and after the thermal expansion valve it goes to the evaporator.

The ***evaporator*** is one more radiator located right behind the dashboard as it takes charge of cooling the air with the refrigerant before it is blown into the saloon of the vehicle. The evaporator is similar to the condenser; it also contains lines that the refrigerant flows through. The evaporator absorbs heat, lowering the temperature to about 32 degrees. The refrigerant evaporates absorbing even more heat. In order to protect the saloon from the condensate which appears on the surface of the evaporator, the evaporate is equipped with a drainage system which helps this moisture to go out of the car (normally it streams under a car).

After the evaporator, the refrigerant in a gaseous state flows through a low-pressure pipe back into the AC compressor to start the process over again.

Exercise 4. Answer the questions.

1. Which three car systems provide a good microclimate in a saloon?
2. What role do they play in wintertime and summertime?
3. How does a ventilation system work?
4. What's the difference in the principle of operation of a heater in water-cooled cars and in cars with air-cooled engines?
5. How many methods of a heat control do you know?
6. How does a water-valve heating system function?
7. How does an air-blending heating system operate?
8. What is the function of an AC system?
9. What components does the AC system have?
10. What does each component (a compressor, a condenser, a receiver/dryer with a thermal expansion valve, an accumulator with an orifice tube, an evaporator) do?

Exercise 5. Match the words in English (1-15) with their Russian equivalents (a-o).

1. heating system	a. с воздушным охлаждением
2. fan	b. дроссель
3. thermal expansion valve	c. осушитель
4. evaporator	d. система подогрева
5. air-blending	e. хладагент
6. high-pressure pipe	f. магистраль низкого давления
7. gaseous state	g. вентиляционное отверстие
8. orifice tube	h. жидкое состояние
9. air-cooled	i. магистраль высокого давления
10. low-pressure pipe	j. с водяным обогревом
11. liquid state	k. испаритель
12. vent	l. вентилятор
13. refrigerant	m. газообразное состояние
14. receiver/dryer	n. терморегулирующий вентиль
15. water-heated	o. смешивание воздуха

Exercise 6. Match the terms (1-7) with their definitions (a-g).

1. refrigerant	a. a device for drying
2. compressor	b. a device that helps a liquid to change from a liquid state to a gas
3. condenser	c. the provision of fresh air to the interior of the vehicle
4. dryer	d. a device used to supply gas at increased pressure
5. evaporator	e. a device for warming the air or water
6. ventilation	f. a substance used for cooling
7. heater	g. a device that cools gases into liquids

Exercise 7. Read about some common signs of a faulty car AC system. Complete the gaps (1-7) with the words given in the box.

Symptoms, accumulate, noises, blow, replaced, water, conditioning

Information source: https://airconditionerlab.com/how-does-car-air-conditioning-work/

Knowing if your air 1) … is faulty isn't as difficult as you may thought. Here are three of the most common 2) … of a bad AC compressor. The first symptom is an AC which does not 3) … cold air. There could be three reasons for that. You could have a low level of the refrigerant, your refrigerant could be leaking, or your compressor could be going bad and needs to be 4) … . Loud noises when your AC turns on are another potential symptom of a bad AC compressor. If any interior components of the system break or the compressor's internal bearings fail, all kinds of easily heard 5) … can be produced. The best thing to do is to replace the entire AC compressor. The third symptom is a water leak. Your AC system is designed to drain 6) … out through the bottom of your car. The drain line can become clogged, causing water to 7) … inside your vehicle.

Exercise 8. Work in pairs. Read and translate a dialogue between a new mechanic and an experienced mechanic. Act it out.

Information sources: https://studentlesson.com/automobile-air-conditioning-system/, https://airconditionerlab.com/how-does-car-air-conditioning-work/

Mechanic 1: I can't understand what's wrong with this car air conditioning. The car owner says about a reduced functionality of the AC system. At first, I suspected a refrigerant leak. I used a detector but everything was fine. The blower motor and resistor are okay,

too. Can you help me?

Mechanic 2: Yes, sure. What exactly does the owner say about the trouble?

M. 1: Well, the AC system cools at first and then gets warm very quickly.

M. 2: Hmm. This may be caused by the various issues. For example, it can be the fuse that powers the AC system.

M. 1: I've checked it. It's okay.

M. 2: What about the expansion valve? It can be clogged. In this case the refrigerant can't flow into the evaporator. And if there is also some moisture, the refrigerant even begins to freeze.

M. 1: I've inspected it as well. It's clean.

M. 2: Then it must be a faulty compressor clutch.

M. 1: The compressor clutch? I haven't thought about it.

M. 2: Yeah, when the clutch gets stuck, the compressor can't maintain the correct pressure. This results in hot air.

M. 1: Oh, I see now. Thanks. I'll check it. And the owner also says that there is an unpleasant odor from the AC vents.

M. 2: That's easy. It can be caused by a moldy evaporator case or a dirty and old air cabin filter.

M. 1: Good. I'll have a look at them.

Exercise 9. Search the Web for more information about the malfunction and repair of an automobile ventilation, heating and air conditioning systems and make a presentation.

Exercise 10. Look through Unit 27 again. Make a list of the words and word combinations you consider to be the terms. Translate them into Russian.

Unit 28. TYPES OF MOTORCYCLES

Exercise 1. Read and memorize the words and word combinations.

1. motorcycle/motorbike мотоцикл
2. bike мотоцикл; мотороллер; мопед
3. two-wheeled двухколесный
4. commute ездить на работу в город (о жителе пригорода)
5. cruise ездить, путешествовать
6. standard motorcycle дорожный вариант мотоцикла
7. cruiser круизер (мотоцикл для путешествий), *разг.* крейсер
8. chopper чоппер (класс мотоциклов с высоким рулём и удобной посадкой)
9. touring bike туристический мотоцикл
10. sport bike спортивный мотоцикл
11. sport touring motorcycle спортивно-туристический мотоцикл
12. off-road motorcycle внедорожный мотоцикл
13. motocross кроссовый мотоцикл; гоночный мотоцикл
14. enduro bike эндуро
15. dual-purpose motorcycle мотоцикл двойного назначения
16. roadster дорожный мотоцикл
17. cc (cubic centimetre or cubic capacity) кубический сантиметр; рабочий объём двигателя
18. tank bag сумка на бак

19. fairing обтекатель

20. windscreen ветровое стекло; переднее стекло

21. naked bike нейкед, «оголенный» мотоцикл (мотоцикл без обтекателей, пластикового обвеса)

22. flexible маневренный, удобный для применения, гибкий

23. engine output мощность двигателя

24. upright seating position сиденье, позволяющее сидеть в вертикальном положении

25. displacement рабочий объём двигателя

26. extended/elongated/stretched удлинённый

27. handlebar руль

28. place one's feet forward выдвинуть ноги вперед

29. spine спина; позвоночник

30. erect вертикальный, прямой

31. lean back slightly откинуться слегка назад, сидеть под углом

32. iconic культовый

33. icon символ, знаковый образ (чего-л.), идол

34. masculinity мужественность

35. steering angle угол поворота; угол поворота управляемых колёс

36. tall высоко поднятый

37. fork вилка

38. appearance внешний вид

39. smaller modification уменьшенная разновидность

40. front fender переднее крыло

41. customized изготовленный по техническим условиям заказчика; с индивидуальной конструкцией и внешним видом

42. front end передняя часть

43. coupled with использоваться вместе с; в сочетании с

44. increased angle for the rake увеличенный угол наклона

45. frame рама

46. rear suspension подвеска задних колёс; задняя подвеска

47. front wheel переднее колесо

48. touring long distance поездки на дальние расстояния; преодоление длинных маршрутов

49. smooth обтекаемый; плавный; ровный

50. storage compartment отсек для вещей; багажник

51. gear снаряжение, оборудование, инструмент; принадлежности

52. passenger capacity возможность перевозить пассажиров

53. huge luggage space segment сегмент мотоциклов с вместительным отсеком для багажа

54. back motion обратный ход

55. largeness большие размеры

56. acceleration разгон; ускорение

57. cornering движение на повороте

58. race track трасса для гонок

59. high-performance engine двигатель с высокими эксплуатационными характеристиками; двигатель высокой мощности

60. lightweight лёгкий; облегчённый

61. disk suspension дисковая подвеска

62. versatile многоцелевой, универсальный
63. aerodynamic fairing аэродинамический обтекатель
64. cover the engine плотно прикрывать двигатель
65. deflect изменять направление, отводить; отклонять
66. drag сопротивление (среды); лобовое сопротивление
67. footpeg боковая подножка водителя и пассажира на мотоцикле
68. ground clearance клиренс; дорожный просвет
69. prone position положение (водителя) почти лёжа
70. off-road use для езды по бездорожью
71. rough terrain неровная местность
72. upward exhaust направленная вверх выхлопная труба
73. high ground clearance большой дорожный просвет
74. cross-country tire шина повышенной проходимости
75. seat height высота сиденья
76. heavy blow тяжелый удар
77. jolt толчок; тряска
78. collision столкновение; удар
79. bump колдобина, выбоина
80. gravel гравий; галька, галечник
81. turn signal сигнал поворота, поворотник
82. one cylinder engine одноцилиндровый двигатель
83. service life срок службы
84. closed track трасса в закрытом помещении
85. long travel suspension длинноходная подвеска
86. tight turn крутой поворот
87. outdoor competitions соревнования на открытом воздухе
88. indoor arena крытый стадион
89. enduro гонка на выносливость
90. long-distance cross-country trail трасса для гонок на длинную дистанцию по пересечённой местности
91. time trial одиночный заезд на скорость
92. closely resemble больше всего напоминать
93. gas tank бензобак; топливный бак
94. tuned настроенный на, обеспечивающий
95. longevity долговечность; долгий срок службы
96. dusty пыльный
97. asphalt road асфальтированная дорога
98. dirt bike мотоцикл, специально изготовленный для грунтовых дорог, кроссовый мотоцикл
99. instrument документ, представляющий собой правовой акт
100. legal допустимый, разрешённый, законный, легальный
101. public road дорога общего пользования
102. center of gravity центр тяжести
103. road bike шоссейный мотоцикл
104. suspension travel ход подвески
105. rough surface неровная поверхность
106. outfit укомплектовать; оборудовать; снаряжать

Exercise 2. Read the international words and guess their meanings.

Motorcycle, bike, motor, specially designed, transportation, distances, cruising, sports, classified into groups, standard, cruiser, integrated, chopper, motocross, enduro, type, style, manufacturer, design, motorcyclist, position, comfortable, ideal, Harley-Davidson, Indian, Excelsior-Henderson, brand, history, icon, television shows, films, symbol, American, modification, stable, passenger, segment, miles, manoeuvring, optimized, track, disk, effective, aerodynamic, clearance, interesting fact, signals, cylinder, service, form, short track, compactness, arena, Kawasaki, Honda, based, special, climate, asphalt, chassis, instrument, legal, public, center of gravity, limited options, extra, weekend, camping.

Exercise 3. Read and translate Text 1.

Text 1. Different Types of Motorcycles

Information sources: https://www.theengineerspost.com/types-of-motorcycles/, https://lemonbin.com/types-of-motorcycles/, https://motonoob.ru/tipy-mototsiklov/

A motorcycle often referred to as a motorbike or bike, is a two- or three-wheeled motor vehicle. A motorcycle can be designed for various purposes, including transportation over long distances, commuting to work, cruising, participating in sports, and riding off-road. Riding a motorcycle is an exciting experience. Motorcycles can be classified into six groups: standard, cruiser, touring, sports, off-road, and dual-purpose. Sport touring is recognized as a seventh group or integrated with a touring group. The most common types of motorcycles found today are a standard motorcycle, a cruiser, a chopper, a touring motorcycle, a sport bike, an off-road motorcycle, a motocross, an enduro bike, and a dual-purpose motorcycle.

Standard motorcycles (the Triumph Bonneville T100, WFM M06), also known as roadsters, are mainly used for traveling on roads. These are the oldest and most common types of motorcycle styles that manufacturers have been making. Standard bikes have a simple design and are suitable for all purposes. These motorcycles range from 125cc up to 1,000cc and can be fitted with luggage, a tank bag, and a separate seat. Due to lack of fairings or windscreens, standards are generally referred to as naked bikes. Standards are particularly suited to beginner motorcyclists as they are flexible, low cost with a moderate engine output and upright seating position.

Cruiser bikes (the Honda Shadow VT 750, Suzuki Intruder CS1400, BMW R1200C, Honda Shadow VT125C) have an upright riding position and a large, comfortable seat making them ideal for casual riding. Some cruisers were built by Harley-Davidson, Indian, and Excelsior-Henderson. Engine sizes for this motorcycle vary greatly from a small displacement engine of 1,000cc or more, depending on the brand. These bikes usually have wide tires and extended handlebars that are even more upright. The riding position on the cruiser allows riders to place their feet forward and hands up. The spine can be erect or can lean back slightly.

A ***chopper*** (the Honda Fury1300) is perhaps the most iconic motorcycle in the history of the United States. It emerged in the late 1950s as an icon to get around the country and it has been featured in numerous television shows, films, and advertisements as an icon of rugged masculinity and a symbol of the traveling American male. The chopper is a type of motorcycle that uses a radically modified steering angle and taller forks for an elongated appearance. Choppers are a smaller modification of cruisers with fewer seats and tanks. As compared to cruisers, they don't have fairings and sometimes a front fender. There are two famous examples of chopper motorcycles, the 'Captain America' and the 'Billy Bike', which are customized Harley-Davidson motorcycles. Choppers often have

the long front ends which extend like forks. They are also coupled with an increased angle for the rake and hardtail frames (frames without rear suspension), taller or shorter handlebars, long or stretched frames and larger front wheels.

If you like touring long distances, the ***touring motorcycle*** (the Honda Goldwing GL1200, Yamaha Royal Star Venture, BMW K1200LT) is right for you. It's comfortable, smooth, stable and offers far more storage compartments than other bikes. It has comfortable upright seating positions for both a motorcyclist and a passenger, a large fairing to block wind and weather while riding. The engine size is large to maintain highway speeds and to carry a lot of gear and clothing. The bike has excellent passenger capacity and is ideal for the huge luggage space segment. Touring motorcycles can travel up to 125 miles on a full tank, while others can go up to 200 miles. Some touring motocycles are equipped with a back motion due to their largeness and difficulties in manoeuvring.

A ***sport bike*** (the Suzuki GSX-1300R, Hayabusa Yamaha FJR-1300, Honda CBR-1100XX Blackbird, Yamaha FJR-1300, Kawasaki GTR-1400, Yamaha YZF-R1, Kawasaki Ninja ZX-10R, Honda CBR600RR) is a motorcycle designed and optimized for speed, acceleration, braking, and cornering on race tracks and roads. These motorbikes are generally built with high-performance engines supported within a lightweight frame, a disk suspension and effective brakes. Sport motorcycles are versatile and can be used depending on the rider's purpose. They have aerodynamic fairings to cover the engine, windscreens that help deflect air at high speeds away from the rider, reducing overall drag. They may have footpegs that are both higher and further forward than in standard bikes, improving ground clearance for the rider when turning to a prone position.

As the name suggests, ***off-road motorcycles*** (Husqvarna CR 125, Gas Gas MC50) are specially designed for off-road use. These are best for handling rough terrain with their upward exhaust, high ground clearance, lightweight frame, lack of fairings and cross-country tires. These bikes offer tall seat heights to adapt to heavy blows, a jolt and collisions from bumps. In addition to their off-road performance, they are often built to ride in sand, gravel, river, mud, or snow. The most interesting fact is that they usually don't have any lights or turn signals. As a rule, off-road motorcycles use one cylinder engine, so their service life is short.

A ***motocross*** (the Suzuki RM-Z450, Honda CRF250R) is a form of off-road motorcycle designed for use in races on short, closed, off-road tracks with various obstacles. These types of motorcycles usually have a small fuel tank for lightness and compactness. Also, they don't have any lights, turn signals and mirrors because they can increase their weight. It has a long travel suspension that allows riders to take jumps at high speeds. These motorcycles may run on single cylinder two-stroke or four-stroke units, varying in size from 50cc to nearly 500cc. The bikes are made to compete in outdoor competitions that feature rough terrains and tight turns and jumps. Riders can also compete in indoor arenas, which are specially built for these competitions. The most famous motocross bikes are made by Japanese manufacturers Kawasaki and Honda.

An ***enduro motorcycle*** (the Yamaha WR250X, Honda XRE300, Honda CR-125, Honda XR-250R, Yamaha XTZ-250 Lander, Yamaha XTZ-750 Super Tenere, BMW R1200GS) is an off-road racing motorcycle used in enduros, which are long-distance cross-country trails used in time trial competitions. They most closely resemble the motocross bike. In fact, they're based on them. They have special features such as a very big gas tank, and engines that are tuned for reliability and longevity. The bikes have travel suspension and are known to be durable over long distances. The engine of an Enduro bike is usually fitted with a single cylinder two-stroke between 125 cc or 360 cc in volume. It

can also be fitted with a four-stroke 195-650 cc cylinder. The large engine is not always an advantage though, and the riders that usually race in the Enduro championships prefer small bikes that are light and easily maneuverable. However, in dry and dusty climates, heavier bikes are preferred over other types.

A ***dual-purpose motorcycle*** (the BMW 1200GS, Suzuki V-strom 650, Kawasaki KLR650) is a type of motorcycle designed for both an asphalt road and off-road usage. Their chassis is usually based on a dirt bike, but they have lights, mirrors, signals, and instruments that make them legal on public roads. They have a higher center of gravity and seat height than other road bikes, which allows for good suspension travel on rough surfaces. They usually have limited storage options but can be outfitted with extra bags to carry some gear for a nice weekend camping adventure. The best part is that you can even go on long trips with this motorcycle.

Exercise 4. Answer the questions.

1. What can a motorcycle be designed for?
2. Which groups can motorcycles be classified into?
3. What are the most common types of today's motorcycles?
4. What do you know about standard motorcycles?
5. What is a cruiser bike?
6. Why is a chopper regarded as the most iconic motorcycle in the USA?
7. What's the difference between choppers and cruisers?
8. Which motorcycle is the best choice for a long-distance touring?
9. What are the features of touring motorcycles?
10. What is a sport bike designed for?
11. What can off-road motorcycles be used for?
12. What are the main characteristics of a motocross bike?
13. What is an enduro motorcycle?
14. What are the special features of enduros?
15. Why is a dual-purpose motorcycle called so?

Exercise 5. Match the words in English (1-15) with their Russian equivalents (a-o).

1. road bike	a. туристический мотоцикл
2. dirt bike	b. обтекатель
3. touring bike	c. мотоцикл двойного назначения
4. off-road motorcycle	d. отсек для багажа
5. dual-purpose motorcycle	e. подножка
6. back motion	f. руль
7. lightweight	g. неровная местность
8. windscreen	h. шоссейный мотоцикл
9. footpeg	i. клиренс; дорожный просвет
10. front fender	j. обратный ход
11. ground clearance	k. мотоцикл для грунтовых дорог
12. handlebar	l. лёгкий; облегчённый
13. rough terrain	m. переднее крыло
14. storage compartment	n. внедорожный мотоцикл
15. fairing	o. переднее стекло

Exercise 6. Read about some more types of motorcycles. Match the motorcycles (1-5) with their definitions (a-e).

Information source: https://www.theengineerspost.com/types-of-motorcycles/

1. A snow-mobile motorcycle	a. It's a small motorcycle which you can also pedal like a bicycle. It's technically different from a scooter. It has a small two-stroke engine up to 50cc or sometimes an electric motor. It has no fairings to block wind and weather. It's popular because it's rather cheap.
2. A scooter	b. It has three wheels, two at the back and one at the front. It's also known as a trike motorcycle. It is built based on bicycle or motorcycle technology and powered by an electric motor, motorcycle, scooter, or car engine. Some of its brands are treated as motorcycles for registration or licensing purposes. The Honda's Gyro range, Piaggio MP3, Yamaha Niken are the examples of this type of motor vehicles.
3. A tricycle	c. It's a light two-wheeled open motor vehicle on which the driver sits over an enclosed engine with his legs together and his feet resting on a floorboard. Its engine size is smaller than motorcycles, 50–850 cc. It's quieter than motorcycles, more affordable, easier to drive, and more convenient to park. Modern models have automatic clutches and continuously variable transmissions.
4. A moped	d. The examples of these motorcycles are ambulance bikes, firefighter bikes, police bikes, etc. They are motorcycles that are specially designed for specific jobs, such as ambulances, blood bikes, fire and military services, as well as delivery services, such as pizza delivery. In the early 1960s, specialized motorcycles were developed for use on farms with mountain goats. The Motocrotte was used in Paris in the 1980s and 1990s to collect dog waste with vacuum suction.
5. A utility motorcycle	e. It's also known as a skidoo. It's a small motorized vehicle built to move across snow and ice. Today, snowmobiling has become a sport that many people have taken up as a hobby. It has a light and powerful two-stroke gasoline internal combustion engines. It's usually designed to accommodate one person; older models could accommodate two people.

Exercise 7. Read about power scooters. Complete the gaps (1-6) with the words given in the box.

Mechanical, clothes, handling, urban, scooter, built

Information source: https://lemonbin.com/types-of-motorcycles/

Power scooters are a burgeoning industry. The aesthetic and the design of the power 1) … are becoming rather popular with electric vehicle companies. In fact, one of the most popular electric scooters in the world is the Vespa. The model has a range of 100 km in 2) … areas and it even has an X model that can go up to 200 km. That isn't bad at all for a standard scooter. It even mirrors the design of the original gasoline scooter. Power scooters usually have a little more power and energy than regular scooters and are 3) … for better speed and sharper turns. They have a footpeg through bodies and enclosed 4) … parts. This design prevents the rider from staining or wrinkling their 5) … . And it also provides the scooter with a lower center of gravity allowing better 6) … and fewer accidents.

Exercise 8. Work in pairs. Read and translate a dialogue between two friends. Act it out.

Information source: https://www.theengineerspost.com/types-of-motorcycles/

Friend 1: What type of motorcycles do you like?

Friend 2: I am crazy about all kinds of sport motorcycles for off-road riding. They are really cool but my favourite one is a trail motorcycle.

F. 1: The trail motorcycle? I've never heard about it.

F. 2: Well, I think it's because trail motorcycles are the most popular sport bikes in the United Kingdom and Spain.

F. 1: What's it like?

F. 2: Hmm… It's small and it's mainly used to test balance skills and accuracy rather than speed. You know, it has only a half seat or no seat. During the trail, the rider stands on the footpegs!

F. 1: It must be really exciting! And what is its engine capacity?

F. 2: It has a small engine from 125cc to 300cc with a two-stroke motor. A fuel tank is tiny, too. So, it's ideal for very short distances with dirt trails!

Exercise 9. Search the Web for the best electric motorcycles and make a presentation about them.

Exercise 10. Look through Unit 28 again. Make a list of the words and word combinations you consider to be the terms. Translate them into Russian.

Unit 29. PARTS OF A MOTORCYCLE

Exercise 1. Read and memorize the words and word combinations.

1. conventional обычного типа; серийный; стандартный
2. gasoline бензин; бензиновый
3. internal combustion engine двигатель внутреннего сгорания
4. electric motor электродвигатель; электромотор
5. diesel engine дизельный двигатель
6. liquid-cooled engine двигатель с жидкостным охлаждением
7. air-cooled engine двигатель с воздушным охлаждением
8. two-stroke engine двухтактный двигатель
9. four-stroke engine четырёхтактный двигатель
10. sequential последовательный
11. manual transmission механическая трансмиссия
12. foot lever педаль, ножной рычаг
13. continuously variable transmission бесступенчатая коробка передач; вариатор; бесступенчатая трансмиссия
14. hydraulic automatic transmission гидравлическая автоматическая трансмиссия
15. frame каркас; рама
16. steering рулевое управление; рулевой механизм
17. rear suspension подвеска задних колёс; задняя подвеска
18. welded сваренный; сварной; спаянный
19. alloy steel легированная сталь
20. strut стойка
21. integral part неотъемлемая составная часть
22. carbon fiber углеродное волокно

23. magnesium магний
24. fuel tank топливный бак
25. battery аккумулятор; (аккумуляторная) батарея
26. clutch lever рычаг управления сцеплением
27. handlebar руль
28. grip рукоять, ручка
29. actuate приводить в действие
30. front brake lever тормозной рычаг переднего колеса
31. rear brake pedal тормозная педаль заднего колеса
32. throttle grip рукоятка дросселя
33. aircraft touch
34. throttle дроссель
35. accelerator газ, акселератор
36. power output выходная мощность, мощность на выходе
37. gear shifter переключатель передач
38. guard ограждение; упор; защитное устройство
39. point of contact точка соприкосновения; точка касания
40. skid занос; боковое скольжение
41. crankcase картер
42. trap ограничивать (в перемещении), заключать (куда-л.), заблокировать
43. start button кнопка пуска, пусковая кнопка
44. kick-starter ножной стартер (мотоцикла, двигателя)
45. control module блок управления; модуль управляющего устройства
46. handgrip рукоятка ручки управления
47. push button нажимная кнопка
48. crankshaft коленчатый вал
49. carburettor карбюратор; карбюраторный
50. choke заглушка; заслонка; закупоривать; сужать
51. ignition key switch ключевой замок зажигания
52. ignition switch замок зажигания
53. starter switch пусковой переключатель
54. starter motor стартерный электродвигатель, стартёр
55. petrol/gas tank бензобак, бак для бензина
56. safe area зона безопасности
57. gallon галлон (США - 3,785л, Великобритания - 4,545 л)
58. front fork вилка передней оси
59. rake угол наклона; угол уклона (головной трубы рамы)
60. trail вылет (вилки переднего колеса мотоцикла)
61. wheel rim обод колеса
62. magnesium-base alloy сплав на магниевой основе
63. machined обработанный на станке; подвергнутый механической обработке
64. failure неисправность; повреждение; поломка; выход из строя
65. fitting подгонка; монтаж, настройка, сборка
66. tubeless tire бескамерная шина
67. seal придавать непроницаемость; закупоривать; герметизировать
68. disc brake дисковый тормоз
69. drum brake барабанный тормоз
70. braking power мощность торможения, тормозная мощность
71. spring пружина, рессора

72. damper демпфер; амортизатор
73. shock absorber rear suspension задний амортизатор
74. shock absorber амортизатор
75. linkage рычажный механизм; соединение
76. swinging arm поворотный кронштейн
77. front suspension подвеска передних колёс; передняя подвеска
78. exhaust pipe выхлопная труба
79. post-combustion gases газообразные продукты сгорания
80. accessories вспомогательное оборудование
81. current ток
82. charging system система подзарядки
83. meet соответствовать; отвечать; удовлетворять
84. power demand потребная мощность, потребности в энергии
85. voltage stabilizer стабилизатор напряжения
86. turn signal сигнал поворота, поворотник
87. horn гудок; клаксон; звуковой сигнал
88. storage accessories принадлежности для хранения
89. peg footrest боковая подножка для ног водителя и пассажира
90. kickstand подножка; подставка, стойка
91. headlight фара (на передней части транспортного средства)
92. side mirror боковое зеркало заднего вида
93. tire покрышка; шина
94. driver seat сиденье водителя
95. third-party сторонняя фирма, независимая третья фирма
96. pannier парная сумка (нагружается на багажник мотоцикла)
97. saddlebag подседельная сумка (на мотоцикле)
98. flashing light мигающий свет
99. LED (light emitting diode) светодиод
100. alert сигнал тревоги; предупредительный сигнал
101. the ball of the foot подушечка ступни; подъём свода стопы; плюсна
102. lower beam ближний свет фар
103. high beam дальний свет фар
104. rod стержень, рычаг; прут
105. dual saddle двойное седло (сиденье мотоцикла)
106. plane mirror плоское зеркало
107. convex выпуклый
108. dashboard панель приборов; приборная панель
109. warning indicator диагностический предупреждающий индикатор
110. bulging вздутие, выпуклость; выгнутость; деформация

Exercise 2. Read the international words and guess their meanings.

Design, factor, form, basic anatomy, components of modern motorcycles, control the transmission, process, circulate, commercial, model, electric motor, diesel, cylinders, configuration, typically, scooters, hydraulic automatic transmission, form the skeleton, passenger, baggage, aluminum, titanium, magnesium, battery, stop, pedal, position, start, stability, accelerator, device, option, contact, control module, symbol, label, starter, carburettor, mixture, activate, central electrical systems, solenoid, combined, term, gallon, combination, stable, manufacturer, deformation, disc, damper, isolate, chassis, defect, shock, location, brand, atmosphere, accessories, voltage, stabilizer.

Exercise 3. Read and translate Text 1.

Text 1. Essential Components of Modern Motorcycles

Source: https://www.theengineerspost.com/parts-of-motorcycle/

Motorcycles can vary in design for several factors, including performance, form, and cost, but the basic anatomy of any motorcycle remains the same. Here are the essential components of modern motorcycles.

The ***engine*** keeps the motorbike running as it controls the transmission and other processes related to the engine's smooth operation. The valve in the engine allows air and fuel to circulate to create combustion. Most commercial motorcycles are powered by conventional gasoline internal combustion engines. But some models use an electric motor and diesel engine. Motorcycles are mostly built with one to four cylinders. The most common motorcycle engine configurations are a liquid-cooled engine, an air-cooled engine, a two-stroke engine and a four-stroke engine.

Typically, the motorcycle uses a sequential manual ***transmission*** moved by a foot lever. Some small motorcycles and many scooters use a continuously variable or hydraulic automatic transmission.

A motorcycle ***frame*** forms its skeleton. It helps to support the engine and provides a space for the steering and rear suspension. It also supports the rider and any passengers or baggage. It is usually made of welded aluminum or alloy steel struts, with the rear suspension being an integral part of the design. Carbon fiber, titanium, and magnesium are used in some costly motorcycle frames. In addition, there are fuel tanks and batteries attached to the frame.

The ***clutch lever*** is located on the left side of the handlebar. It disengages and engages power from the engine to the rear wheel. The rider has to use the left hand to pull the clutch lever towards the grip.

Most motorcycle brakes actuate the two wheels independently. A ***front brake lever*** is on the right side of the handlebar. It is used to operate the front brake. It is pulled to actuate the brake to stop.

Using the ***rear brake pedal***, riders can keep their right hand fully on the throttle grip. This allows using the clutch in this position to stop and start very slowly. It's like an aircraft touch where you go slow and then accelerate without stopping. The rear brakes are designed to provide stability.

The ***throttle*** is commonly known as an accelerator. The device controls fuel and airflow into the engine, producing more or less power output. To accelerate the motorcycle, turn the throttle grip towards you. Similarly, to slow down, roll the throttle away from you.

A ***gear shifter*** shifts the gears of the transmission up or down. Scooters and some automatic models of motorcycles may not have this control. Some motorcycles have pedal or button shifting options. The gear shifter operates sequentially.

Motorcycle ***engine guards*** help protect a bike's engine in an accident. It's worth the money and easy to install. They serve as the first point of contact between your bike and the ground in the case of a skid. It will prevent damage to the crankcase and avoid trapping your foot when falling to the ground.

A ***start button*** is also known as a kick-starter. It is typically found on the right control module, next to the handgrip. The push button will usually have the symbol shown on the left or be labeled START. The kick starter is an external lever attached directly to the engine's crankshaft.

The carburettor motorcycles have a ***choke*** that is used only when starting the engine in cold conditions. It chokes the airflow and allow for a richer fuel mixture. Once the motorcycle starts running smoothly, it must be turned off. The choke has a symbol that is usually located on the left side.

An ***ignition key switch*** is also known as an ignition switch or starter switch. It activates the vehicle's central electrical systems. The switch provides power to the starter solenoid and ignition system components in internal combustion engine motorcycles. This is often combined with the starter switch, which activates the starter motor. It is located in a few places on the motorcycle but is usually found around the handlebar or on the side of the motor. The turn of the key powers the rest of the motorcycle.

A ***fuel tank*** can be called a petrol tank or gas tank; the term is usually applied to the part of an engine system in which fuel is stored and operated or released. However, it also provides a safe area for knees to hold while riding. Motorcycle fuel tanks usually hold about 1.5 – 8.5 gallons of gas, but most have a gas tank with 3 – 6 gallons capacity.

A ***front fork*** holds the front wheel and allows steering. The combination of rake and trail in the front fork determines how stable the motorcycle is.

Wheel ***rims*** are steel or aluminum, magnesium-base alloy, or machined aluminum. A rim is the frame of a tire that holds the force and tension caused by the vehicle's weight and the effects of various road conditions. The manufacturers have carefully considered and enhanced the safety of the rim to prevent any accidents due to rim failure or deformation. Proper fitting between the tire and the rim is essential for tubeless tires to seal the air.

Motorcycles typically have two independent ***brakes***, one on the front wheel and one on the rear. Nevertheless, some models have linked brakes, whereby both can be applied simultaneously using only one control. ***Disc brakes*** and ***drum brakes*** are two braking systems used in today's motorcycles. Disc brakes are widely used in large motorcycles, as disc brakes can have significantly higher braking power. Drum brakes were used regularly before the invention of disc brakes. Some manufacturers may still use these brakes on smaller motorcycles or as a rear brake.

The ***rear suspension*** of the motorcycle uses a spring and damper combination to isolate the chassis and rider from road defects. The motorcycle uses a single shock absorber rear suspension, which connects the rear swinging arm to the motorcycle's frame. Usually, this shock absorber is in front of the rear wheel and uses a linkage to attach to the swinging arm. The design of the rear suspension can be very different compared to the front suspension. It works with the front suspension to reduce road or trail impact. Some motorcycles don't have rear suspension.

The ***exhaust pipe*** is a common modification in motorcycles; it gives the motorcycle a louder sound and it has different forms and locations depending on the brand and model. Most of the exhaust pipes are mounted back along the bottom of the motorcycle. The primary purpose of the exhaust system is to direct post-combustion gases from the engine cylinders and away from the driver into the atmosphere.

The ***battery*** in a motorcycle is similar to that of a car's battery, which provides power to the engine and other accessories. It supplies additional current when the charging system cannot meet the power demand. Also, it acts as a voltage stabilizer for the charging system. Motorcycle batteries are almost always under the rider's seat. They are usually small, so they cannot last long without the engine running.

Exercise 4. Answer the questions to the text.

1. What essential components of modern motorcycles can you name?
2. Why does a motorcycle need an engine?
3. What types of transmission do motorcycles use?
4. What role does a motorcycle frame play?
5. What is the frame made of?
6. What is the function of a clutch lever?

7. What is a front brake lever used for?
8. What is a rear brake pedal needed for?
9. What does a throttle control?
10. What does a gear shifter do?
11. What do the engine guards protect?
12. Where is a start button located?
13. Which component of a carburettor motorcycle allows starting the engine in cold conditions?
14. What does an ignition key switch activate?
15. What is the gallons capacity of the motorcycle fuel tanks?
16. What is the function of a front fork?
17. What are wheel rims?
18. What braking systems are used in today's motorcycles?
19. What do you know about a motorcycle rear suspension?
20. Where is an exhaust pipe mounted?
21. What does a battery do?

Exercise 5. Match the words in English (1-22) with their Russian equivalents (a-o).

1. accelerator	a. тормозной рычаг
2. battery	b. заглушка; заслонка
3. brake lever	c. двигатель
4. brake pedal	d. трансмиссия
5. choke	e. подвеска передних колёс; передняя подвеска
6. clutch lever	f. топливный бак
7. engine	g. защитное устройство
8. exhaust pipe	h. газ, акселератор
9. foot lever	i. руль
10. fork	j. замок зажигания
11. frame	k. подвеска задних колёс; задняя подвеска
12. front suspension	l. вилка
13. fuel tank	m. обод колеса
14. gear shifter	n. тормозная педаль
15. guard	o. кнопка пуска, пусковая кнопка
16. handlebar	p. аккумулятор
17. ignition switch	q. дроссель
18. rear suspension	r. каркас; рама
19. start button	s. переключатель передач
20. throttle	t. педаль, ножной рычаг
21. transmission	u. выхлопная труба
22. wheel rim	v. рычаг управления сцеплением

Exercise 6. Here are some more basic parts of a motorcycle. Match the components (1-10) with their descriptions (a-j).

Information sources: https://www.theengineerspost.com/parts-of-motorcycle/, https://techbullion.com/6-motorcycle-safety-tech-trends-for-2021-that-you-need-to-know/

1. Turn signals	a. They are a thick piece of rubber which is fitted onto the wheels of a motorcycle. They are the only link between the vehicle and the road. They transmit the motor's power to the road, absorb shocks from uneven road surfaces, support the vehicle's weight, transmit accelerating

	and braking force to the ground. Your safety depends on the maintenance and the choice of them. Checking their pressure to ensure they are correctly inflated, can make a real difference in how long they last.
2. Headlights	b. Motorcycles do not have any special space available for storing, except for some models of motorcycles made for long-distance travel. So, if you want to store something on a motorcycle, you will need to get third-party accessories to bring the items with you. But some older models had a storage compartment mounted behind the seat, often supplemented by panniers or saddlebags. Some common options are a rear carrier bag, which can be either a bag or box mounted on the back seat of the motorcycle, and a tank bag, which has straps or magnets that mount to the fuel tank to provide storage options.
3. Side mirrors	c. These flashing lights help you take safe turns on the road. The lever is usually found on the left side of the handlebar, directly next to the left handgrip, for easy access with the left hand. To turn at the traffic lights, you move the lever to the left or right to signal the direction you're turning. Also, they give a very stylish look to the motorcycle. These LED lights are incredibly bright and have a long service life, so visibility won't be a concern if you're on the road at night or in the middle of heavy rain or fog.
4. Tires	d. This part is an alert system. It is the device that makes a loud noise as a signal of warning. Pressing its button on the handlebar you warn other road users of imminent danger or your presence when a motorcycle is in motion.
5. A driver seat	e. These footrests are used to rest and protect your feet and give you a reference point for using your foot control. Whether mounted on the front, rear, or both, these components allow riders to center their weight on the wheel. You should keep the ball of your foot on this part and move it back and forth on the controls as needed.
6. Storage accessories	f. These are one of the most critical safety features. They are large and powerful; they are located at the front. They work to give visibility in low light conditions or at night, and they also let people know you're there. They are also helpful in difficult light conditions like dusk, during dawn, or when there is a sudden cloud cover. Controls for them can be found on the left control module and often have a toggle switch between a lower beam and a high beam.
7. A horn	g. It is a metal rod attached to a motorcycle, lying horizontally when not in use, that may be kicked into a vertical position to make contact with the ground to support the vehicle when it is stationary. It permits the bike to be held upright without leaning over the aid of another object or a person. Generally, there are two types of this component. Almost all motorcycles have a side stand that is normally located on the left side roughly under the footpeg. A center stand is used on motorcycles that can keep the weight of their bike almost entirely upright.
8. Pegs	h. It's a safety technology which was developed by Samsung in 2016. It is made up of a smartphone-connected display. The smart, transparent screen connects to a smartphone via Wi-Fi. The screen is installed on the shield's lower side to ensure it doesn't obscure the rider's vision. To

	get alerts and GPS navigation directions on the screen, one has to download an app on their smartphone. The app can also notify a rider of any incoming messages and calls. To ensure the rider doesn't get distracted by the incoming calls, the app can send a message to the caller telling them the rider is on the road.
9. A kickstand	i. Almost all motorcycles have these components on the sides. They reflect clear images, so they are vital for smooth driving. Drivers can get an idea of oncoming traffic from behind with these parts. Convex ones used in motorcycles provide a larger field of view than plane ones.
10. A smart windscreen	j. Every motorcycle has this part. It's a thing used by riders and passengers for sitting on, but the size, shape, and place of it can vary depending on the type of a motorcycle. It is located over the chassis and is large enough for a passenger to mount the motorcycle behind the rider. A dual saddle or bench type is the most common. A single or solo type is usually large enough for a rider used in racing and off-road motorcycles.

Exercise 7. Read about the motorcycle's dashboard. Complete the gaps (1-10) with the words given in the box.

Speed, have, indicates, gauge, handlebar, odometer, instrument, speedometer, kilometers, configuration

Information source: https://www.theengineerspost.com/parts-of-motorcycle/

The motorcycle's dashboard is critical in communicating messages from the vehicle to its operator. It consists of an 1) … panel, which usually houses the speedometer, odometer, and tachometer. The dashboard may vary in location and 2) … as per the motorcycle's make and model. But it is always found above or below the 3) … as it needs to be in plain view while sitting on the motorcycle. Most motorcycles 4) … warning indicators, so as motorcycles become more complex, you may see additional warnings. A tachometer 5) … the current revolutions per minute value produced by the motorcycle. Not all motorcycles have a tachometer. A speedometer is a 6) … that measures and displays the instantaneous speed of a vehicle in miles/ 7) … . Apart from this, it also displays the mileage of the vehicle. A 8) … is the instrument which shows how fast the vehicle is moving. Using a speedometer can also prevent motorcycle accidents. The rider can control the 9) … and thus restrict speeding unnecessarily. An 10) … shows how far the vehicle has travelled.

Exercise 8. Work in pairs. Read and translate a dialogue between an intern and a mechanic. Act it out.

Information sources: https://motorcyclehabit.com/12-common-motorcycle-problems-every-rider-should-know/, https://techbullion.com/6-motorcycle-safety-tech-trends-for-2021-that-you-need-to-know/

Intern: Why are flat tyres a common problem among motorcycles?

Mechanic: Well, of course, it may happen just because of a nail on the road but most of the times it's because a lot of riders don't really take proper care of tyres.

I.: Yeah, I know the pressure must be checked on a regular basis to ensure the tyres are correctly inflated.

M.: That's right, it's important and can really prolong their service life. By the way, a smart tire pressure and temperature monitoring system can be installed in a motorcycle. It enables a rider to see the parameters while riding. Some TPM systems have Bluetooth tire gauges, while others send alerts in case a problem is detected.

I.: Sounds cool! No doubts, such systems make the tire pressure routine checks much easier and more frequent. And they're an important safety technology, too. They must be rather expensive!

M.: Yes, you're right. But they're really convenient and cost-effective. Besides checking the pressure, tyres need an occasional visual inspection and regular maintenance. There are a lot more factors that may cause a flat tyre.

I.: Do you mean age, persistent usage and so on?

M.: Exactly. In our region extremely cold weather conditions in winter, exposure to sunlight in summer time and bad road conditions may damage tyres a lot and lead to a high wear.

I.: And are there any obvious signs of a worn tyre?

M.: Yes, sure. There are a lot of them. For instance, bald or brittle spots, places that are bulging, and cracks. If you see any of them, the tyre must be replaced. Riding a motorcycle with worn or flat tyres can be really dangerous!

Exercise 9. Search the Web for the functions of the motorcycle parts and make a presentation about them.

Exercise 10. Look through Unit 29 again. Make a list of the words and word combinations you consider to be the terms. Translate them into Russian.

Unit 30. COMMON MOTORCYCLE PROBLEMS

Exercise 1. Read and memorize the words and word combinations.

1. maintenance техническое обслуживание и текущий ремонт
2. visual inspection визуальный контроль; наружный осмотр
3. fuel injector топливная форсунка; топливный инжектор
4. issue вопрос; проблема
5. wear down изнашиваться, стираться
6. malfunction не срабатывать, работать неисправно; сбой; неисправность
7. gas leak протечка топлива
8. vacuum leak утечка вакуума; утечка воздуха
9. brittle ломкий, хрупкий; крошащийся
10. gasket прокладка, сальник, уплотнение
11. plugged забитый; засорённый
12. jets распылители, сопла, форсунки
13. take apart разбирать на части
14. removing извлечение; разборка, демонтаж
15. throttle body корпус дроссельной заслонки
16. rubber seal резиновый сальник, резиновое уплотнение, резиновое уплотнительное кольцо
17. degrade изнашиваться
18. erratic idling нестабильная работа (двигателя) на холостом ходу
19. loss of power потеря мощности
20. start-up запуск; пуск
21. start запускать; заводить; включать
22. below freezing ниже нулевой отметки; ниже нуля
23. voltage вольтаж, напряжение
24. cold weather холодная погода

25. amperage сила тока в амперах
26. thicken сгущаться, загустевать
27. preventive maintenance планово-предупредительный ремонт; плановое техническое обслуживание и ремонт
28. storage conditions условия хранения/содержания
29. charging зарядка
30. drain утечка; непроизвольный расход
31. grounding заземление
32. prone склонный, предрасположенный (к чему-л.)
33. wiring проводка; электропроводка
34. oil leak утечка масла
35. occur происходить, случаться, совершаться
36. crankcase картер двигателя
37. oil pan масляный поддон; поддон картера
38. cylinder head крышка цилиндра; головка цилиндра
39. oil drain plug пробка для спуска масла
40. rust коррозия; ржавчина
41. half-full полунаполненный
42. high humidity высокая влажность
43. fork вилка
44. viscous вязкий, тягучий
45. friction трение
46. worn tyre изношенная шина
47. tread протектор (покрышки)
48. tough прочный, износоустойчивый, крепкий
49. misuse неправильное использование
50. high-octane высокооктановый (о бензине)
51. gas бензин, горючее, топливо
52. ethanol этанол
53. additive примесь; присадка
54. plug up закупоривать; засорять; забивать
55. squeaky brakes скрипучие тормоза
56. exposed незащищённый, открытый; подвергающийся воздействию (окружающей среды)
57. getting lodged забиваться (в щели)
58. brake pad тормозная накладка
59. rotor ротор; рабочее колесо
60. grease смазка
61. caliper piston поршень суппорта
62. gear box коробка скоростей; коробка передач
63. clutch handle рукоятка включения скорости
64. tightness натяг; натяжение; тугость
65. loose незатянутый; разболтанный
66. tight тугой; крепко затянутый
67. backfire давать обратную вспышку (о двигателе)
68. lean бедный (о топливной смеси)
69. rich богатый, сверхбогатый (о топливно-воздушной смеси в двигателе внутреннего сгорания)
70. spark plug свеча зажигания

71. ignite воспламенять(ся); зажигать(ся)
72. exhaust pipe выхлопная труба
73. combust гореть, воспламеняться
74. exhaust header выпускной коллектор
75. augmented reality дополненная реальность (технология построения с помощью компьютера изображений реального мира, которые накладываются на реальные изображения и выводятся пользователю)

Exercise 2. Read the international words and guess their meanings.

Million motorcycles, registered, popular, classic motorbikes, problems, basic, visual inspection, injectors, carburetor, mix, mechanical, vacuum, extra degrade, diagnosed, idea, local mechanic, diagnosis, region, start, temperature, voltage, amperage, preventive, factor, role, electrical, cylinder, minutes, problematic, detail, practically, regular intervals, stop, park a bike, comfortable, consult an expert mechanic, service, optimal function, octane, ethanol, gas stations, elements, rotor, inspect, cable.

Exercise 3. Read and translate Text 1.

Text 1. Motorcycle Problems Every Rider Should Know

Sources: https://motorcyclehabit.com/12-common-motorcycle-problems-every-rider-should-know/, https://www.whitesbodyworks.com/6-most-common-motorcycle-problems-and-what-to-do-about-them/

There are more than a million motorcycles registered in the UK alone and they are certainly a popular way of getting around. Many people ride classic or older motorbikes and take loving care of them. Any motorcycle may have problems from time to time. A lot of them can be prevented by basic maintenance and an occasional visual inspection. It's good to be aware of the most common problems, if you're a new bike owner or you're thinking about buying one.

Although more and more motorcycles use fuel injectors nowadays, there are still a lot of motorcycles with a carburetor. So, the ***carburetor issues*** may occur rather often. The carburettor mixes the petrol and air to ensure the smooth running of the engine. Like most mechanical parts the carburetor wears down over the years. When it malfunctions, the motorcycle has troubles with running or simply can't run at all. The most common problems are gas leaks, vacuum leaks, brittle gaskets, plugged jets, etc. The best way to prevent the carburetor issues is to simply clean it out once every 1-2 years. If you prefer DIY, it's possible to take it apart and clean each piece with an ultrasonic cleaner and replace any gaskets as needed or there are some tips in the web how to clean it without removing.

A ***vacuum leak*** happens when extra air gets in, usually around the carburetor and throttle body. This has a rubber seal that can dry out and degrade over time so it's important to check it frequently. Leaks can often be misdiagnosed but, if you have a problem with an erratic idling or a loss of power, it's worth checking out if this is the problem. It's a good idea to take your bike to your local friendly mechanic to get a proper diagnosis and repair.

Motorcycle owners in the regions with cold winters often face the problem of the ***cold weather start-ups.*** They have difficulty to start their motorcycle if the temperature is below freezing the night before. The main reason is the battery. The voltage on batteries slowly decreases. This happens mostly because people ride their motorcycles less during cold weather and the battery isn't charged. Also, the battery sometimes can't give the amperage the engine needs to start. Besides the battery, the engine can also malfunction when the weather is intensely cold. A hard frost can make the oil inside the engine thicken. So, the engine needs more power from the battery to get it started. A preventive maintenance

can help to avoid such problems.

Battery issues are probably the most common problem because a number of factors can influence the work of the battery. Besides the cold air, such factors as the age of the battery and the motorcycle, charging, and storage conditions play a significant role. The drain and poor grounding are the common malfunctions. Battery issues and ***electrical issues*** can go hand in hand, but they can also be completely separate problems. You can have a perfectly good battery and still run into electrical issues. Motorcycles are prone to electrical concerns because they have a great deal of wires. Water and/or sunlight can easily destroy the wiring if it's not connected or protected right.

Another common problem you might encounter is an ***engine oil leak***. This may occur because of a faulty gasket on the crankcase, oil pan or cylinder head. It's critical to get this diagnosed properly. An oil drain plug can be replaced in about 15 minutes but the cylinder head gasket can be more problematic because you have to take the engine apart. If you are unsure of a faulty detail, it's a good idea to go to an experienced mechanic.

Rust is more common in older bikes and can occur practically anywhere including a fuel tank. If you leave your bike for a long period with a half-full tank it can lead to problems over time. It's more likely to happen, if you are parked in an area where there is relatively high humidity. It's important to check your tank at regular intervals and, if there is a rust problem, get it resolved straight away. The best way to stop it from developing at all is to ensure that your tank is filled with gas most of the time, especially if you are leaving your bike parked up for a while.

Fork oil leaks may also happen quite often. The forks on your older bike are also quite complicated parts. They are filled with viscous oil that helps handle the weight of the front end. The wrong oil or a leak can cause friction and damage. If you start to feel every bump on the road and your ride becomes uncomfortable, you should check the oil levels or whether there is a leak. On some bikes, the fork assembly can be complicated, so it's better to consult an expert mechanic. Also, it's important to have the fork checked whenever you have a service.

Worn tyres are a pretty big danger when it comes to two-wheeled motorbikes. Modern tyres are a lot tougher than they used to be, but it's still important to check the tread regularly and replace wheels that look worn or have some damage on them.

A ***misuse of fuel*** may cause problems as well. Most motorcycles require a certain type of fuel for an optimal function. It's a high-octane (no less than a 91 rating) gas, free of ethanol, which is used for high compression engines in motorcycles. An ethanol-free gas is especially important for motorcycles with a carburetor because it's common for ethanol additives to plug up the small jets inside so that no fuel can pass through the carburetor at all. This problem can be easily prevented. Riders just need to pay attention to the gas they use and make sure they use gas stations that claim to have the ethanol-free gas.

Squeaky brakes are more common among motorcycles compared to other vehicles because they're more exposed. Brakes on a motorcycle don't have any covering and are more susceptible to the elements. Common reasons for the squeaky brakes are rocks, water and moisture getting lodged in between the brake pad and rotor. Other reasons may include worn out brake pads, uneven rotors, and lack of grease in between the caliper piston and the brake pad. Maintenance of brakes is essential since it has everything to do with safety. If you're worried about the squeaky brakes, make sure to inspect them several times a year.

Most motorcycles have a manual gear box with a clutch handle. Pulling the clutch handle lets a rider change gears depending on the speed. Motorcycles commonly have issues with the ***clutch handle tightness***. Clutch handles can either be too loose or too

tight. If a clutch handle is too loose, you don't have enough force to disengage the clutch. If it's too tight, the clutch is always disengaged. The usual cause for a too tight clutch handle is that the owner or a mechanic tightened the cable too much. A too loose clutch handle means the cable has become loose over time, so it just needs a little bit of tightening. It's a common problem but it can easily be fixed by simply adjusting the cable.

Exercise 4. Answer the questions to the text.

1. What are the most common problems with motorcycles?
2. What issues may occur with a carburetor?
3. What is the best way to prevent the carburetor problems?
4. When does a vacuum leak happen?
5. What are the signs of the vacuum leak?
6. Where can motorcycle owners face the problem of the cold weather start-ups?
7. Why do riders have difficulty to start their motorcycle during intensely cold weather?
8. What factors can influence the operation of a battery?
9. What can cause much damage to the wiring?
10. Why does an engine oil leak happen?
11. What problem may occur, if you leave your bike with a half-full tank for a long period of time?
12. What is a possible trouble with your motorcycle, if you start to feel every bump on the road?
13. Why must a rider take care of the tyres?
14. What gas is needed for an optimal function of a motorcycle?
15. What are the common reasons for the squeaky brakes?
16. What are the typical issues with a clutch handle?

Exercise 5. Match the words in English (1-15) with their Russian equivalents (a-o).

1. additive	a. зарядка
2. brake pad	b. заземление
3. charging	c. резиновое уплотнение
4. gas	d. примесь; присадка
5. grease	e. разбирать на части
6. grounding	f. протектор (покрышки)
7. leak	g. натяжение; тугость
8. oil pan	h. проводка; электропроводка
9. rubber seal	i. протечка
10. rust	j. изношенная шина
11. take apart	k. тормозная накладка
12. tightness	l. смазка
13. tread	m. коррозия; ржавчина
14. wiring	n. бензин, горючее, топливо
15. worn tyre	o. масляный поддон

Exercise 6. Match the terms (1-5) with their definitions (a-e).

1. An amperage	a. use of (something) in the wrong way or for the wrong purpose
2. A fork	b. is a chemical substance that exists in gasoline and is used to measure the quality of the fuel

3. The misuse	c. a shaped ring of rubber or other material sealing the junction between two surfaces in an engine or other device
4. A gasket	d. the strength of an electric current in amperes
5. Octane	e. a pair of supports in which a motorcycle wheel revolves

Exercise 7. Read about a backfiring. Complete the gaps (1-8) with the words given in the box.

Ignite, mixture, enough, gets, pipes, bang, make, reasons

Information source: https://motorcyclehabit.com/12-common-motorcycle-problems-every-rider-should-know/

A backfiring sound is often associated with motorcycles. There are even some riders who purposely 1) … their motorcycle do it. However, it isn't good for a motorcycle to backfire because that means there are problems with its engine. There are several 2) …, why a motorcycle can backfire, but the most common one includes the engine running lean or running rich. When the engine runs rich, the cylinder 3) … too much fuel and not enough air. Too much fuel leads to the spark plug being unable to 4) … all the fuel. The excess fuel is carried out into the extremely hot exhaust 5) … and combust with the atmospheric air, which causes that popping sound. When the engine runs lean, it gets too much air and not 6) … fuel. Air doesn't burn, the fuel does. So, when there's too much air, the fuel won't combust. Then, the exhaust valve opens and the air-fuel 7) … hits the hot exhaust header, the fuel ignites and makes the loud 8) … sound.

Exercise 8. Work in pairs. Read and translate a dialogue between two friends. Act it out.

Information source: https://techbullion.com/6-motorcycle-safety-tech-trends-for-2021-that-you-need-to-know/

Friend 1: I think that motorcycles are extremely dangerous.

Friend 2: Really? Why do you think so?

F. 1: Well, they have less protection for the riders compared to other vehicles. I mean the riders are more likely to be seriously or catastrophic injured in road crashes.

F. 2: I can't agree with you. I believe that motorcycles themselves aren't dangerous at all. The factors that really matter are the riders' skills and driving experience.

F. 1: I see what you mean. But, anyway, having almost no protection can be a big problem.

F. 2: Yeah, you're right. By the way, I've read about the latest safety tech trends. Motorcycle manufacturers work hard to make bikes safer.

F. 1: Great! What exactly do they introduce?

F. 2: A lot of things! Airbags, antilock brakes, a smart windshield, a smart tire pressure monitoring system, and other technologies.

F. 1: Oh, I watched a video about these smart techs. And as to an airbag system, I know that Honda introduced the bike mounted airbag system on their Goldwing model lineup. It protects the rider's head in case of a frontal collision, doesn't it?

F. 2: Yes, it does. And there is a second types of the airbag system which is more commonly used. It's worn as a vest, a jacket, or a full-length suit. You can see it in motorcycles by Ducati and BMW. The system is inflated using a CO2 cartridge. In case of a crash, the vest inflates, cushioning the rider from body injuries.

F. 1: It sounds really cool! And I've heard about helmet manufacturers that produce helmets with app powered audio and Bluetooth capabilities so that they can connect to a

phone. This allows the motorcyclists listening to navigation instructions and communicate with other riders.

F. 2: Yeah, that's right. Talking about communication among drivers of the vehicles, there are bikes that are equipped with V2V or B2V technology.

F. 1: V2V? B2V? What do those stand for?

F. 2: Well, it's a vehicle-to-vehicle or bike-to-vehicle wireless communication technology. The on-board sensors on the bike collect information such as speed, position, braking, and location. With the help of an on-board computer, the B2V or V2V system sends alerts to other motorcyclists or vehicles on the road. And turning back to helmets, other manufacturers are working on AR ones!

F. 1: AR helmets? I've never heard about them. What are they like?

F. 2: Well, they are the helmets with a built-in Augmented Reality. They help to minimize distracted driving as they have GPS maps and a speedometer.

F. 1: By the way, my neighbour, who is a true biker, has a helmet with a rear view mirror and a wide-view visor that gives a 360-degree road view. This allows him seeing all the blind spots on the road. Also, he says the bikes with antilock braking system are safer.

F. 2: I agree. ABS increases a bike's stability and also prevents wheels from locking. This technology uses speed sensors to determine when the wheels are about to lock and adjusts the braking pressure for the wheels not to lock. So, thanks to it a motorcycle is less likely to be involved in a crash.

F. 1: All right, all right! You've convinced me that safety tech innovations can prevent motorcycle accidents and keep riders safe on the roads!

Exercise 9. Search the Web for the best motorcycle tech innovations or motorcycle safety tech trends and make a presentation about them.

Exercise 10. Look through Unit 36 again. Make a list of the words and word combinations you consider to be the terms. Translate them into Russian.

РАЗДЕЛ 2. BUSINESS ENGLISH

2.1. Тексты делового характера для изучающего чтения и пересказа

Unit 1. APPLYING FOR A JOB

Text 1. Applying for a Job, Recommending for a Job

1. Read and translate the text using a dictionary.

When you request employment (= apply for a job), your primary objective is to interest a prospective employer enough so that he/ she will schedule interview with you.

This can be done by sending an application form or a letter of application to the prospective employer. Applications for jobs are most often made in form provided by the commercial organization or the manufacture company to which the application is being made. For more senior appointments, however, applicants are often expected to write a letter which contains all the relevant information about the training, qualifications, reasons for applying and so on. Before you write a letter of application you will have to collect all the information you will need for your letter education, previous employment, employer, dates, etc.

Normally your letter of application presents not only your qualifications but your interest in a specific job. Include the exact job title, use a standard area titles such as 'finance', 'sales' or 'research'. Include the field you were trained in. This is especially applicable to those in technical fields. It is especially important to include the functional area of the company where you want to work. Examples of these company divisions are: 'research and development', 'production', 'marketing and sales', 'administration and finance'.

Begin your letter by stating the subject of the letter, which job you are applying for and where you heard about it – in a newspaper, in a journal, from the employment agency, from a friend. End your introduction with a statement of your ability to do the job.

The body of your letter should provide the information that will convince your reader of your qualifications. Mention any relevant courses you took and any pertinent job experience. Take care to refer to any specific information mentioned in the advertisement.

Above all, emphasize your 'strengths' (strong points). If you are applying for a sales job, for example, you'd better stress your ability to communicate effectively, not your limited experience. If you have special skills or training, such as word processing, be sure to mention it.

Conclude your letter of application by referring to your resume (curriculum vitae – BrE). State that you are available for interview, list any dates on which you cannot be available. As always, your letter must be smooth, natural and free of errors.

2. Match the following words with their meaning.

1) to request employment	a) главная задача/цель
2) employer	b) опыт
3) previous employment	c) запланировать собеседование
4) relevant	d) анкета
5) standard area title	e) гладкий и естественный (о стиле письма)
6) to convince	f) значимый/значительный
7) strong points	g) руководящая должность
8) primary objective	h) работодатель
9) company division	i) иметь возможность прийти на собеседование
10) application form	j) обращаться с просьбой о приёме на работу
11) to schedule interview	k) прежнее место работы

12) body of a letter	l) стандартное название сферы деятельности
13) senior appointment	m) сильные стороны
14) experience	n) основная часть письма
15) available for interview	o) убедить
16) smooth and natural	p) подразделение компании

3. Complete the sentences with the prepositions given in the box.

3.1. Read and translate the application letter.

3.2. Fill in each blank in the application letter with a preposition from the following list:

With, in, for, at, of

Dear Sir,

I am interested 1) … applying 2) … the post of Marketing Manager 3) … your company.

The vacancy was advertised in last week's 'Evening News' and I hope it is not too late to apply 4) … the position.

I am at present working as Assistant Marketing Manager 5) … Yorkshire Engineers, Ltd. My duties and responsibilities include all types of administrative work, drawing up marketing plans, product development, organizing and directing the presentation 6) … goods, working 7) … clients and solving problems that arise.

Although I enjoy working 8) … Yorkshire Engineers and have an excellent relationship 9) … my present employers, I feel that 10) … this stage 11) … my career I would like more responsibility and greater scope 12) … putting into effect some of the up-to-date ideas that are now being developed and applied 13) … marketing. I also feel that my prospects 14) … promotion are limited and that there would be more scope 15) … my skills and talents if I join a larger, more dynamic company.

I have strong communication and leadership skills, I have proven experience 16) … leading groups and working 17) … the public, I have all assets that are helpful 18) … marketing management I enclose my resume 19) … your convenience and the names of two people who are prepared to act as my referees.

If you consider that my qualifications and experience are suitable 20) … filling in this vacancy, I would be available 21) … interview 22) … any time.

Yours sincerely,

Robert Dean

4. Match the jobs and professions in list 2 to the activities in list 1. Make up sentences according to the model:

e.g. A manager is a man who conducts and controls a business.

List 1 – activity:

1. coordinating the activities of lower-level managers in promoting goods and services;

2. producing brochures and leaflets when making something for sale known to the public;

3. prescribing medicines;

4. dealing with correspondence, keeping records, making arrangements and appointments for the boss;

5. hiring and training all the people employed by a company;

6. buying and selling business shares;

7. providing safeguard against damage or loss, making contracts that promise to pay a sum of money in case of accident, injury or death;

8. designing and making bridges, buildings, roads;

9. keeping and examining business accounts.

List 2 – jobs and professions:

private secretary
doctor
personnel manager
accountant
insurance agent
marketing director
advertiser
stockbroker
construction engineer

5. Make up your own list of key-words and expressions to the text 'Applying for a Job. Recommending for a Job' and to the application letter of task 3. The list should include not less than 15 items. The list can be presented in the form of a table.

6. Explain the meaning of the following words and expressions.

To advertize a vacancy, administrative work, up-to-date ideas, prospects in promotion are limited, primary objective, to schedule interview, lower-level managers, referees.

Speaking Practice

1. Find the answers to the questions in the text 'Applying for a Job, Recommending for a Job'.

1. What is your primary aim when you apply for a job/ put in a request for employment/ make a request for a job?

2. In what cases sending a letter of application is preferable?

3. What kind of information do you have to gather before writing a letter of application?

4. In what way should you express your interest in a specific job?

5. How do you usually learn about job vacancies?

6. When you introduce yourself to a prospective employer, what information matters most/is the most important?

2. Discuss the content of the text in the form of a dialogue using the set of questions given above. Use communicative signal words (SW) and expressions for the questions and answers.

Question SW	Answer SW
First of all…	It is evident that…
Can you tell me…	We can state that…
It is interesting to know…	As for we can say that…
I would like to ask you…	I am sure that…
Can I ask you…	To my mind/in my opinion…
One more question is…	It seems to me that…
Do you know…	I would like to say that…
Have you got any information …	If I am not mistaken…

How do you think…	Above all…
To conclude…	You see…

3. Present the general ideas of the text in the form of oral retelling. Make use of the information given below.

1. Structural expressions for the introductory part of your retelling:

The article (text) is called…
The title of the article (text) is…
The article (text)is published in…
The article is printed in…
The article consists of…
The article is devoted to…
The text touches upon the problem…
In the introductory part the author points out…

2. Structural expressions for the body of your retelling:

The author raises the problem of…
The main part of the text informs about…
The article contains statistics about…

3. Structural expressions for the concluding part of your retelling:

In the concluding paragraphs it is pointed out…
Summing up the information, it is important to say that…
Generalizing the information, it is necessary to say that…

Writing Practice

1. Read and translate the following sample letters of application. Fulfill the tasks on the letters' vocabulary.

Sample Letter of Application (1)

the sender's address
the inside address

Dear Mr Bowers,

I am writing to confirm my wish to apply for the position of computer engineer with your company. I am pleased to accept your offer. Sure, I'd like to meet you to discuss some technical matters, especially concerning your computer facility.

I wonder if there is a probationary period during which the position and the salary will be reviewed.

I look forward to joining your company and to contributing to the company's work.

Signature

1.1. Find the words or phrases in Sample Letter of Application (1) that tell you the following.

1. to give support or certainty to a fact, statement – …
2. a proposal – …
3. in connection with – …
4. a system that makes a particular activity possible – …
5. the time during which the applicant is tested for the job – …
6. to re-examine/ re-consider – …
7. to help the company to work successfully – …

Sample Letter of Application (2)

Flat 8, 34 River Street Gosport
Co Hampshire PO 56 BL
England
15 May 2018

Mr C Farham
Personnel Manager
Milco Ltd
26 Beacon Street
Halifax HX 57 Pt
England
Dear Mr Farham

Application for the post of Divisional Software Engineering Manager

Further to our telephone conversation last Friday, I can confirm that I wish to apply for this post. I enclose a copy of my curriculum vitae.

You will see that I have added some information about my previous experience: I worked for one year with a company in Paris called ILE as a Systems Analyst, then I came to England to work for Top Systems Co as a Client Consultant, but last November I was promoted to Senior Software Development Engineer.

I have also added the name of one of my referees, Mr John Andrews. You may contact him at any time. If you require any other references, perhaps you will be so kind as to let me know. I can come to Halifax for interview at almost any time. The only date when I am not available for interview is May 27th.

Yours sincerely,
John Tomlinson

1.2. Find the words or phrases in Sample Letter of Application (2) that tell you the following.

1. the person who is concerned with hiring and discharging employees – …
2. position/ job/ employment – …
3. continuing the subject of – …
4. John was given a higher position – …
5. a person who provides written information about someone's character, ability, skills, etc. – …
6. a piece of written information about someone's character, ability, skills – …

2. Imagine that you are an applicant for a job. Write your own letter of application (120-150 words) for a job in English. Choose an appropriate job title from the list below. Follow these guidelines:

1. Introduce yourself: name, age, nationality.
2. Mention the source of information about the job vacancy.
3. Describe your relevant work experience or justify your lack of experience.
4. Describe your qualifications and skills.
5. Mention the reasons for seeking employment with the company/ for joining this company.
6. Describe how you meet the requirements of the job.

7. Mention your personal qualities – ability to communicate, to deal effectively with difficult situations, to work long hours, to cope with pressure, to be part of a team, etc.

8. Say whether you are fluent in at least one foreign language.

9. Ask if the job you apply for involves a lot of travelling abroad, if it requires a lot of organizing meetings and conferences.

10. Say when you are available for interview.

11. Mention any enclosures (references, your resume (C.V.), an official letter of recommendation).

Job Titles

financial analyst	специалист в области финансов
marketing research analyst	специалист по изучению рынка сбыта
business analyst	специалист по вопросам конъюнктуры
production engineer/ manager	инженер/менеджер по организации производства
sales manager	менеджер по продажам
securities analyst	специалист по ценным бумагам
designing engineer	инженер-конструктор
mechanical engineer	инженер-механик
software engineer	инженер-программист
software development engineer	инженер-разработчик программного обеспечения
marketing manager	менеджер по маркетингу
export sales manager	управляющий экспортными операциями
managing director	директор-распорядитель
accounting manager	главный бухгалтер

3. Write a letter (120-150 words) recommending your friend (your group-mate/your business partner) as a suitable candidate for one of the following positions: a secretary/ a teacher/ a training program participant/ a managing director/ an adman/ a sales representative. Study the information given below.

When people apply for jobs or professional training programs, the application process usually includes at least two recommendations from colleagues, professors or friends who can honestly evaluate the applicant's professional ability and potential.

Here are some important points to remember in writing the letter of recommendation:

1. How long have you known the applicant and in what capacity (as a coworker, business partner, teacher, etc.).

2. Mention specifics, not generalizations. It is good to write that someone is hard-working and organized, but you need to support these statements with concrete examples.

3. Write about what the applicant is capable of doing, what makes him/her special.

4. Evaluate the applicant by comparing him/her with others you have observed in your work.

5. Your evaluation of the applicant may be based on the following categories, each of which can be described as ‘excellent’, ‘very good’, ‘average’, ‘below average’:

– Intellectual Ability
– Work Habits
– Business Practice
– Seriousness of Purpose
– Entrepreneurial Potential
– Managerial Skills
– Emotional Maturity

– Resourcefulness and Initiative
– Adaptability to New Situations
– Motivation
– Leadership Qualities

6. One page is sufficient. Quality, not quantity, is what is important. Do not put something in if an immediate connection cannot be made between the information you give and the applicant's ability to do the job or to participate in the training program.

Unit 2. RESUME

Text 1. Writing a Resume

1. Read and translate the text using a dictionary.

When you are looking for a new job, you must prepare a short written account of your education and work experience. It is called 'curriculum vitae' (also C.V) in British English and resume in American English.

Many companies expect all your personal information to be entered on a standard application form. Unfortunately, no two application forms are alike, and filling in each one may present unexpected difficulties. Some personnel departments believe that the resume (CV) and application letter give a better impression of a candidate than a form.

The resume that accompanies the letter provides an overview of what you have already done. The resume should create one dominant impression: that you are a highly motivated person who has the ability and maturity to do a job well. Before you compose your resume list all of the pertinent information about your education, your job experience, your goals and your personal interests.

Then select the information that is appropriate for the job you want emphasizing the accomplishments that differentiate you from other candidates. If you have received academic honours or awards, or you have financed your own education, include this information as well.

Remember, the resume is a screening device. Big corporations get hundreds of thousands of them every year. The personnel manager or the staff officer has to read a lot of them a day. So, you have got ten, may be twenty seconds, to show him/ her that your resume is worth a second look.

There is no single correct format for a resume (curriculum vitae). Whatever its layout it should be brief – one or two pages are sufficient – easy to read, and well organized. An employer should be able to see at a glance what your qualifications are. Many resumes contain the following sections: personal information, education, languages you speak (if necessary), work experience, interests, referees.

2. Match the following words with their meaning.

1. a short-written account	a) отличия и награды за успешную учёбу
2. work experience	b) подходящий, соответствующий требованиям
3. personal information	c) стандартная форма анкеты
4. personal manager	d) опыт работы
5. personnel department	e) высокомотивированный
6. to create an impression	f) краткое описание/информация в письменном виде
7. to list	g) создать впечатление
8. appropriate	h) сотрудник отдела кадров
9. maturity	i) перечислить

10. accomplishments	j) письмо-заявка об устройстве на работу
11. academic honours/awards	k) зрелость/опыт
12. a screening device	l) отдел кадров
13. application letter	m) анкетные данные соискателя
14. highly motivated	n) средство отбора/проверки
15. standard application form	o) достижения

3. Complete the sentences with the prepositions given in the box.

3.1. Read and translate the letter of application.

3.2. Fill in each blank in the application letter with a preposition from the following list:

At, after, for, in, of, on, to

Dear Sir/Madam,

May I introduce myself 1) … you? I have studied 2) … Gottingham and Leeds Universities and now I am a final year student … Leeds University, where I will graduate … July 2021. I would like to spend next year improving my Russian; therefore, I would like to stay … Russia … some time. I have learnt Russian … about five years … evening classes once a week … University.

Since I am bilingual … both English and German I might use these language skills to teach. Would you require someone as a language and teaching assistant … your foreign languages department?

As to my qualification and previous work experience, I will have an English law degree and I would get the TEFL (Teaching English as a Foreign Language) qualification … a one-month course, which I intend to do over the summer. I have taught German … foreign students in Germany and I had plenty … opportunity to practice my communication and translation skills.

I would be very grateful if you could offer me such work, even … a semi-voluntary basis.

Yours faithfully,

Julia Glazer

4. Make up your own list of key-words and expressions to the text 'Writing a Resume' and the letter of application from task 3. The list should include not less than 15 items. The list can be presented in the form of a table.

5. Explain the meaning of the following words and expressions.

Previous work experience, achievements and accomplishments, resume as a screening device, communication and translation skills, personal information, to be appropriate for a job, to improve a foreign language, to have the ability and maturity to do a job well.

Speaking Practice

1. Find the answers to the questions in the text 'Writing a Resume'.

1. What is British English for resume?
2. What application documents are required of those who apply for a job?
3. What information should be listed in your resume?
4. What kind of impression should a resume make on the reader (the staff officer)?
5. What is the main objective of a resume?
6. Who is usually responsible for looking through resumes received by a company?
7. What kinds of sections does a resume usually consist of?
8. Why should the layout of a resume be well organized and brief?

2. Discuss the content of the text in the form of a dialogue using the set of questions given above. Use communicative signal words (SW) and expressions for the questions and answers.

Question SW	Answer SW
First of all…	It is evident that…
Can you tell me ...	We can state that...
It is interesting to know…	As for we can say that…
I would like to ask you…	I am sure that…
Can I ask you…	To my mind/in my opinion…
One more question is…	It seems to me that…
Do you know…	I would like to say that…
Have you got any information …	If I am not mistaken…
How do you think…	Above all…
To conclude…	You see…

Writing Practice: Resume Construction

1. A resume (C.V.) will be the first impression an employer has of you. Imagine that you are a job applicant. Before writing your own resume, you should:

1.1. Draw the pattern of your resume:

1. Personal information (name, nationality, date of birth, marital status, permanent address, current address).
2. Education and languages.
3. Work experience.
4. Interests/hobbies.
5. Referees.

1.2. Translate and analyze the sample variant of the resume.

name	Julia Glazer
nationality	German
date of birth	06/12/96
marital status	Single
current address	16, Cooking Street Leeds L52 UK
education	1. School 2004-2014 Bolz Gymnasium Rottenburg, Germany 2. University a) Sept. 2014 – Oct. 2015 – Gottingham University b) since Oct. 2015 – Leeds University law student
languages	German (mother tongue) English (advanced level) Russian (intermediate level)
work experience	1. June – Sept. 2014, Rottenburg, Position: assistant accountant in a medium-sized firm. Skills: computing skills; given tasks to work independently,

	I was left on my own to find my way through various computer programmes. 2. Sept. 2014- March 2016, Leeds Position: community Services volunteer, personal care assistant. Skills: I had to cope with long hours and almost no spare time for myself; the commitment and responsibility involved were a very valuable experience. 3. Sept./Dec. 2016 – German Embassy, Washington DS, USA Position: internship at press office. This involved teamwork, helping to produce press releases and to organize press conferences, answering phone calls and letters, news presentations at the morning conferences, legal research, translating. Skills: I improved my communication and presentation skills in public relation duties. I had to deal with vast amount of text and paperwork.
interests	Travelling, horse-riding, river-trips
referees	Dr. H. Storey Mr W. Hinds Mrs A. Lawson Law Faculty University of Leeds, Leeds L52

1.3. Find English equivalents to the following Russian word combinations. Consultthesample (1.2.).

Помощник бухгалтера, работать самостоятельно, самостоятельно разбираться в чём-либо, доброволец местной социальной службы, помощник по уходу за инвалидом, справляться, взятые на себя обязательства и ответственность, стажировка в пресс-службе, работа в команде, поиск обоснований юридического характера, иметь дело с .../ обращаться с ... .

1.4. Study the Language Bank below.

1. устроить, организовать (что-либо)	to arrange (meetings/ conferences/ shows) to make arrangements for (meetings/ presentations/ press conferences) to work out arrangements for ... to successfully arrange (meetings/ presentations) to be successful in arranging meetings/ conferences)
2. договориться (о чем-либо)	to arrange for (an interview/ an appointment)
3. анализировать/ изучать	to analyse/ examine
4. применять	to apply (new ideas to practice/ theory to practice/ new developments to practice
5. заниматься (чем-либо)/ выполнять (задание/ работу по долгу службы)	to deal with to handle to do one's job to perform one's duties to be concerned with ...
6. осуществлять/ выполнять	to carry out (sales analysis/ production analysis/ one's duties)

7. проводить/ осуществлять (анализ/исследование чего-либо)	to conduct/ to do/ to make (a survey/ marketing research
8. управлять/ руководить	to manage successfully effectively efficiently (people/ money/ a business/ the company/ products)
9. разрабатывать/ проектировать	to develop (a product/ the company's marketing strategy/ plans/ programmes) to design (a machine/ a new building)
10. составлять/ разрабатывать (планы)	to draw up (marketing plans)
11. содействовать (чему-либо)	to promote (sales/ production of...)
12. заведовать/ руководить (чем-либо)/ отвечать по службе (за что- либо)	to manage (a factory) to be in charge of (a factory/ a department) to head (a team of 20 people/ a department) to be responsible for (recruiting personnel/ employing people) to be at the head of (a company/ an organization)
13. работать в качестве (кого-либо)	to work as (a consultant for a company)
14. осуществлять контроль/ наблюдать за работой (за деятельностью кого-либо)	to supervise (the work of 30 operating employees/ a team of 20 people)
15. получать/ приобретать опыт (в чем-либо)	to gain experience of presenting new products/ of conducting press conferences
16. находиться в постоянном рабочем контакте (с кем-либо)	to keep closely in touch with smb.

1.5. Translate the sentences from Russian into English using information of the Language Bank (1.4.).

1. У меня есть опыт в организации презентаций и пресс-конференций.
2. Вам необходимо разработать план организации данной встречи.
3. Есть ли у Вас опыт проведения рекламных компаний?
4. Можете ли Вы провести исследование современных тенденций на рынке сельскохозяйственной продукции?
5. У меня есть обширный опыт в составлении бизнес-планов.
6. Работая в качестве помощника руководителя, я находился в постоянном рабочем контакте с юристами и представителями различных банковских организаций.
7. Мне бы хотелось проявить свои навыки в разработке маркетинговых исследований.
8. Мне приходилось успешно осуществлять контроль за деятельностью команды из 10 человек.
9. Моя работа была связана с применением новых маркетинговых стратегий.
10. Мне бы хотелось эффективно применить свой опыт и знания, а также иметь возможность карьерного роста (to have a career opportunity).

1.6. Write a resume as if it were your own resume.

Unit 3. INTERVIEWING APPLICANTS FOR JOBS

Text 1. Interviewing Applicants for Jobs

1. Read and translate the text using a dictionary.

In different companies and organizations, different conventions apply to the process of recruiting, selecting and hiring prospective employees.

Many companies expect all personal information of the applicant to be entered on a standard application form. Unfortunately, no two application forms are alike, and filling in each one may present unexpected difficulties. Some personnel departments believe that the CV (the resume) and application letter give a better impression of a candidate than a form. But it is well known that the applicant usually tries to make a good impression on the personnel officer in his/her application letter, the applicant may often look good on paper. In order to take the final decision staff officers or personnel managers often invite the shortlisted applicants for interview.

There are different kinds of interviews: traditional one-to-one interviews, board or panel interviews where one or more candidates (group interview) are interviewed by a panel of interviewers and even 'deep-end' interviews where applicants demonstrate how they can cope in actual business situations. The atmosphere of an interview may vary from the informal to the formal and interviewers take a friendly, neutral or hostile approach. Different interviewers use different techniques and the only rules that applicants should be aware of may be: 'Expect the unexpected' and 'Be yourself'.

The interviewers are usually interested in educational background and qualifications of the applicant, his or her previous work experience, the reasons the applicant applies for a new job, if the applicant is highly motivated or not, if he or she is good at working with people.

The applicant for the job wants to know if there are choices of promotion, if there is a probationary period, if there are transport facilities to or from work, if the job entails job-related travel, if there are some extra benefits such as company cars, company organized holidays and trips, children's holiday camps.

Although interviews have widespread use in selecting staff many problems exist:

1) reliability of most interviews is very questionable;

2) conclusions about the applicant are often made within the first 10 minutes of the interview and that is why any additional relevant information about the applicant is either overlooked or ignored;

3) merely having a pleasant personality does not necessarily ensure that the person will be a good employee;

4) interviewers have personal prejudices and these prejudices may play a role in the interviewing process.

But all these disadvantages of a job interview may be rejected as insignificant against the statement that many applicants look quite good on paper.

2. Match the following words with their meaning.

1) recruiting, selecting and hiring	a) претендент, включённый в окончательный список для собеседования
2) staff officer	b) значимая информация
3) conventions	c) недостатки
4) shortlisted applicants	d) благоприятное впечатление
5) panel interview	e) сотрудник отдела кадров
6) job-related travel	f) уровень образования

7) probationary period	g) набор, отбор и наём (кандидатов на работу)
8) deep-end interview	h) групповая форма собеседования
9) educational background	i) дополнительные услуги, доступные работникам компании/фирмы/учреждения
10) questionable	j) служебный транспорт
11) favorable impression	k) нормы, сложившаяся практика
12) relevant information	l) утверждение/убеждение
13) extra benefits	m) испытательный срок
14) company cars	n) собеседование «с погружением» в реальные рабочие ситуации
15) disadvantages	o) спорный
16) statement	p) командировка

3. Re-read text 1 and answer the questions.

1. Why do personnel managers believe that inviting job applicants for interview makes selection procedure more reliable and trustworthy?

2. Are job interviews conducted on the same pattern? If not, what makes them typical in some respect?

3. What is the applicant usually interested in when interviewed?

4. Which of the disadvantages of a job interview would you mention as especially damaging?

4. Explain the meaning of the following words and expressions.

Reliable and trustworthy, personal information of an applicant, unexpected difficulties, to look good on paper, hostile approach, expect the unexpected, chances of promotion, relevant information about the applicant.

Text 2. Interviewing, Screening and Hiring

1. Read and translate the text using a dictionary.

It is not an easy task to find someone suitable for the job. Recruiting and selecting people involves careful analysis. The candidate's abilities, attitudes and interests are matched to the requirements of the job. Interviewing, screening and hiring are done in the best interests of both parties.

Applicants for a management training program or for an internship abroad are asked a lot of questions concerning the profile of the company the applicant is currently working for. The interviewers want to know how successful his/her company, is, what sort of problems or unpleasant situations it faces They may be interested in the company's annual output, annual turnover, number of employees in the company, its international contacts or long-term foreign partners.

Some interviewers give candidates a hard time by asking them difficult and confusing questions: What do you think are your strengths and weaknesses? Which is more important for you – status or money? How long do you think you'd stay with us if you were appointed? How would you rate your present boss? Why do you want to leave your present job?

Now it is quite common for companies to hold progress interviews (staff assessment interviews) to see how their employees are getting on in their jobs. Progress interviews are conducted at least once a year. Employees' performance and the development of their career are discussed at such interviews. Participants on training courses often take part in

similar mid-course/mid-term interviews too.

Employees usually take advantage of staff assessment interviews to find out what the boss thinks of them, to discover their own weaknesses, to have the opportunity to discuss their work in detail with the boss, to find out how to work more effectively and efficiently, to discuss their future with the company or organization, to see how their careers are developing, etc.

The company and the managers take advantage of these progress interviews to find out what their employees do well and could do better, to benefit from closer contact with individual employees and create closer relationships, to find out which people should be promoted and which employees can benefit most from further training, etc.

The interview situation as such should be considered from the point of view of both interviewer and candidate/interviewee. During the interview, the interviewer makes notes on each candidate's experience or potential. The checklist for interviewers usually contains the following headings:

Working with other people (being part of a team)
Working under stress
Dealing with people in English
Working experience
Learning something new/being able to learn new things
Education and training
Health
Present job/job satisfaction
Personality
Being able to delegate responsibilities to subordinates

The candidate when preparing to attend the job interview should rehearse some of his/her answers at home, find out as much as possible about the company or the training institution, prepare some questions to ask about the organization or company.

2. Find in text 2 the English equivalents for the following key words and expressions.

1. набор кадров	
2. проверка, отбор кадров	
3. наем на работу	
4. стажировка	
5. столкнуться с какой-либо проблемой	
6. причинять беспокойство/ доставлять неприятности	
7. организовать/ провести собеседование/интервью	
8. исполнение служащими своих обязанностей	
9. получить пользу от дальнейшей подготовки	
10. перечень, памятка (для проведения собеседования)	
11. индивидуальность (кандидата/ претендента)	
12. давать поручения подчиненным	

3. Make up your own list of key-words and expressions to texts 'Applying for a Job, Recommending for a Job' and 'Interviewing, Screening and Hiring'. The list should include not less than 15 items. The list can be presented in the form of a table.

Writing Practice

1. Here is some advice that might be given to an inexperienced interviewer. Use the given tips in the text, in which you describe the standard interviewer's activity.

1. Make sure you are not interrupted or phoned during the interview.
2. Read the candidate's CV and application letter before the interview begins.
3. Ask the candidate to explain why he/she keeps changing jobs.
4. Make sure you have a clear picture of the nature of the job.
5. Ask each candidate the same questions.
6. Decide on a maximum of four key qualities required for the job.
7. Make sure the candidate has an uncomfortable, low chair.
8. Ask the candidate about his political and religious beliefs.
9. Only trust a candidate who looks you straight in the eye.
10. Trust your first impressions.

You can make use of the following modal constructions in your text:

First of all, you should…
You'd better…
It seems to me, you ought to…
You shouldn't
You may or you may not…
It is evident, that you should…
Whether you like it or not, but you have to…
Before the interview you are to…
You are allowed to…

Speaking Practice

1. Find the answers to the questions in the text 'Interviewing, Screening and Hiring'.

1. What is expected from an applicant for a training program when he/she has an interview for an internship abroad?
2. What questions would you consider difficult and confusing when interviewed? Why?
3. What are the main differences between a job interview and a staff assessment interview?
4. What kind of preparatory work does a job interview involve from the viewpoint of both parties - the interviewer and the applicant?

2. Work in pairs. Discuss the content of text 2 in the form of a dialogue using the sets of questions given above. Use communicative signal words (SW) and expressions for the questions and answers.

Question SW	Answer SW
First of all, …	It is evident that…
Can you tell me…	We can state that…
It is interesting to know…	As for _____ we can say that…
I would like to ask you…	I am sure that…
Can I ask you…	To my mind/in my opinion…

One more question is…	It seems to me that…
Do you know…	I would like to say that…
Have you got any information …	If I am not mistaken…
How do you think…	Above all…
To conclude…	You see….

3. Arrange the most important things for you in your future work in order of importance (the list of opinions is given below). Express your own opinion in the form of an oral essay. Make use of the relevant expressions from the box below.

Job satisfaction

– being able to learn new things
– earning plenty of money
– being part of a team
– meeting people through work
– having pleasant colleagues
– being praised by my superiors
– a pleasant working environment
– using a foreign language
– financial independence
– good chances of promotion
– professional growth
– being a boss/exercising power
– status of my organization

The most important thing for me is ...
The second important thing for me is ...
I don't consider this aspect of my job very important.
I am afraid you are mistaken/wrong when you...
I think your opinion is absolute nonsense.
It matters very little for me/very little in my job.
... is less significant than ...
... is more significant/more important than...
I don't attach too much importance to ...

4. Talk about job satisfaction or job dissatisfaction as any talk to a counselor in a job agency is centered round job satisfaction or job dissatisfaction.

Work with a partner. Make conversations in which (A) is trying to find out reasons for changing the job or job preferences while (B) is giving his/her reasons or explanations.

First make sure you are familiar with the relevant vocabulary then talk on the topic using prompts in columns (A) and (B).

Relevant vocabulary:

promotion, chances of promotion, prospects of promotion
great/heavy responsibilities, is responsible for...
independence, making independent decisions
challenging job/job is challenging
varied/exciting job/experience
demanding boss/manager
monotonous/boring job

to work long hours
exciting experience
creative abilities
interesting job
demanding job

Prompts:

A	**B**
Why did you change your job? Didn't you like your job? Why? Why did you leave the company for which you worked so long? Why did you leave your job? What didn't you like in your job? Did your job become too boring, too monotonous? Were there any prospects of promotion in the company you worked for?	I had to change my job because... there wasn't inner freedom, the salary was... the working hours were... the journey to work was... the job was too... my responsibilities were too... I was responsible for too many... I wasn't earning a good... the money wasn't good enough. I didn't have enough time. there wasn't enough... I didn't have enough responsibility.
Do you like working: in a team? alone? indoors/outdoors? with computers? long hours? in a big company?	I like/don't like: being away on a business trip (at least) once a month I'd like to: start my own advertising company, do consultancy work in computers, have a lot of responsibility and a lot of freedom.
What kind of job do you think is suitable for you? What job suits you best?	I enjoy: having responsibility for... taking decisions on my own. having more independence. working in a small-sized company. working with computers. working in a team. doing a challenging job.

5. Get ready for the job interview simulation. Make use of the model questions in A and prompts in B. Remember: this should be a step-by-step (section-by-section) discussion. You can also use the information presented in task 3 in the simulation.

(A) model questions	(B) prompts for answers
Personal information	
When were you born? Can I have your date of birth? What's your marital status? Where do you live? What's your present address?	I was ... on ... in 19... . I am married/single... . I got married in ... . I am married with one child. I am not married yet.

	I am going to get married next... . My home address is ..., but my present address is.... I have lived in ... for ... years/ since ... . We moved to ... in … .
Education	
And what about your education? – Secondary education, I mean. In how many subjects did you take secondary school diploma exams? Did you do well in your exams? What marks did you get in …? Have you ever failed an exam? What qualifications did you get when you finished school?	I went to two secondary schools from ... to ... . I attended ... from ... to… . I took my school-leaving exams in … . 1 did well/ badly in ... . Yes, I have. I failed my mathematics exam in ... . I got the high school Graduation certificate/ school-leaving certificate/ secondary school graduation certificate.
What about your further education? Did you go to university? What subjects did you specialize in? What was your major at university? Did you get a university degree? Did your studies at university lead to a degree? Did you graduate with honours? Did you get a distinction diploma?	For 5 years, from ... to ... . I was at university/ at college in ... . I specialized in ... My major at university was .... I was an economics major. My studies at... led to a Bachelor's/Master's degree in … . I got my specialization diploma in … Yes, I did. I was good at most subjects. I graduated from ...with...
Work Experience, Abilities and Skills	
Have you ever got a job? When exactly was that? When did you start work? What posts did you hold? When were you promoted to this position? What companies have you worked for? Have you ever worked with a volunteer organization? What jobs did you apply for, when you came to ...? What department did you work in? What skills did you acquire while working for/ with ... company? What were your professional responsibilities and duties?	I got a job as a ... for ... company. I worked there for ... years. I worked for ... years with a company in ... . I held two posts there. I held a key management position in ... company. I was promoted to this position/ to this department in ... I have worked for …/with... . When I came to ... I started work for... company. I acted as ... when he/ she was on vacation, carried out several... projects, was responsible for ..., took part in... I acquired leadership qualities, I acquired ability to communicate and work in a team, to arrange business meetings. I did the typing, the filing, the photocopying sorted out mail..., did most of the secretarial work in the office. I improved my communication skills.

Are you skilled in statistics/ using a computer/ marketing/ programming/ business accounting? Are you good at dealing with difficult people? Do you have the skill to cope with a difficult job? Have you ever been involved in managerial functions? Do you have any managerial skills? Are you good at delegating responsibilities to subordinates?	I don't think I am very skilled in ... but I am hard-working. When I worked for ... company, I was involved in a number of projects which required management skills. I have got some experience at delegating some responsibilities to the members of the department/to my group-mates/ to the members of a team/
Other Information and Recommendations	
Do you know how to use a PC/ how to work with PC/ how to operate a PC/ how to handle a PC?	Yes, I do. I did a two-months advanced computer course when I was at school/ ft the university.
	I am fairy fluent in ... .
What languages do you speak? Are you fluent in English/ German/ French?	My written/ spoken English/German/ French is fairly good. I can make myself understood in….
Can you provide references from at least two referees?	Yes, I can. I am sure they will confidently recommend me.

Unit 4. BUSINESS LETTERS

Text 1. Writing Business Letters

1. Read and translate the text using a dictionary.

Everyone writes business letters from time to time – to request information, to order a product, to complain about something, to apply for employment or to a training programme. Examples are: letters of application for jobs, scholarships, etc.; letters asking for information about courses, services, etc.; letters demanding money (which include complaints, a demand for a refund).

Before you sit down to write a business letter you should think carefully about your purpose. Decide in advance, why you are writing your letter.

Most businesses receive hundreds of letters each day, so your letter should be brief and to the point, it should be well organized and laid out very clearly. Important information should appear early in the letter and you should not digress from the main subject. Be concise and try to sound as natural as possible. Stilted, very formal, unnatural or flowery language very often gets in the way of clear communication.

The first paragraph of your letter should introduce your subject and mention any relevant previous correspondence or conversation. The rest of your letter should present your reader with the fact needed to understand what you are saying. Your conclusion should reinforce your message.

When typing your business letter or composing it on a computer, leave wide margins, at least an inch (=2.54 cm) all around. Type your letter single-spaced and use an acceptable format. One of the most common is the block format. The block format letter begins every line at the left-hand margin and separates paragraphs with a double space. If you use letterhead paper, supply only the date typing it two spaces below the letterhead.

The style of business letters is changing rapidly. Every year it gets simpler and less formal. Except for a few firms, business correspondents prefer simple English to express what they want to say as effectively as possible. Time is more precious than ever to a busy executive and he does not want to have to read a lot of unnecessary words. But the writer of a business letter must create a good impression, especially if he is writing a letter of application, so a few words to promote a feeling of exactness and goodwill are quite appropriate. However, compliments must not be exaggerated, as they may produce the opposite effect, and the reader may feel that the writer is being insincere. In other words, the style of a business letter need not be very formal, but on the other hand it must not be too informal and chatty.

2. Match the following words with their meaning.

1) to promote a feeling of...	a) отклоняться/ уходить в сторону от основного предмета (письма)
2) to reinforce one's message	b) фирменный бланк
3) to get in the way of...	c) запрашивать информацию, сведения
4) purpose/ aim	d) жаловаться, подавать жалобу
5) to digress from the main subject	e) ввести/ представить тему или предмет (письма)
6) to introduce one's subject	f) преувеличивать
7) letterhead paper	g) решить заранее
8) to complain	h) мешать/ препятствовать/ быть помехой
9) to exaggerate	i) стимулировать ощущение/ способствовать ощущению ...
10) to decide in advance	j) поле (страницы)
11) concise	k) точность/тщательность
12)stilted	l) представить/сообщить читателю о ...
13) margin	m) слишком официальный
14) exactness	n) усилить содержание сообщения
15) to request information	o) цель
16) to present the reader with ...	p) краткий и точный

3. Complete the sentences with the prepositions given in the box.

3.1. Read and translate the application letter.

3.2. Fill in each blank in the application letter with a preposition from the following list.

With, in, for, at, of, from

Dear Mr Foster,

Applying ____ the post of Marketing Manager

I noted _____ interest your advertisement in yesterday's Daily World.

You will see _____ the enclosed resume that I have four years experience in marketing. My duties are concerned_____sales promotion. My responsibilities have included all types ____ administrative work, product development, arranging and attending sales conferences and presentations, working ____ clients and solving problems.

Although I have an excellent relationship with my present employers, Sunshine Communication, which I joined five years ago, I feel that my prospects with them are limited and there are no opportunities ____ promotion ____ Sunshine. I am convinced that there would be more scope _____ my talents and skills with a larger, more dynamic company.

If you consider that my qualifications and experience are suitable, I would be available ____ interview ____ any time.

Yours sincerely,

John Raser

Text 2. Business Letter Pattern

1. Read and translate the text using a dictionary.

Business Letters are usually quite formal in format and style. The different parts of a business letter are:

1. the heading (= the sender's address)
2. the recipient's name, position and address (= the inside address)
3. the salutation (= the greeting)
4. the body of the letter
5. the closing salutation (= the farewell = the complimentary close)

The Heading consists of the sender's return address and the date or the company letterhead or sometimes the company logo. When writing the heading spell out words like *street, avenue, drive, east, west* in full. (Note: in the USA abbreviations 'St' and 'Ave' for *street* and *avenue* are often used. You may, however, abbreviate the names of counties and the names of the states

e.g. Ca/CA - California, Pa/PA - Pennsylvania, in the USA).

When writing your Russian address for a foreign correspondent, do not translate street or city names into English: 'Prospect Mira' but not 'Peace Avenue'. You should write: 'dom', 'korpus', 'kvartira'.

The Dates in the heading are written and spoken in the following way:

e.g. 2 March 1998 – the second of March, nineteen ninety-eight = March the second, nineteen ninety-eight.

Be careful! Dates are sometimes written in number form only: 2.03.98. In Britain this would mean 'the second of March, nineteen ninety-eight'. In the USA, and on many computers, it would mean 'the third of February, nineteen ninety-eight'.

The Inside Address begins at the left margin, four to six lines below the heading, with an appropriate title: 'Mr' (for a man who has no other title), 'Mrs' (shortened from 'Mistress', for a married woman), 'Miss' (placed before I lie name of an unmarried woman or girl), 'Ms' [miz] (for a woman who does not wish to be called either 'Miss' or 'Mrs'), 'Dr' [dokte] (for a person holding one of the highest degrees given by a university, such as PhD - Doctor of Philosophy).

(Note, in American English after 'Mr' or 'Mrs' comes a full stop: 'Mr.', 'Mrs.', 'Mrs' or 'Mr' without a full stop at the end is British English).

e.g. Mrs. Helen Tomlinson
Personnel Manager
109 East Jones Street
Raleigh, North Carolina 27611
USA

The Greeting appears two spaces below the inside address:

e.g. Dear Mr South, Dear Sir(s), Dear Dr. Murphy, Dear Sir or Madam.

The Body of a business letter consisting of introductory, main and concluding paragraphs contains your message. If your letter takes more than one page, place the addressee's name, the date and the page number in the upper left-hand corner of the second page.

The way you begin your letter is very important. You should make the subject of your letter clear immediately:

e.g. Thank you for your letter dated 24 November.

Благодарю Вас за письмо от 24 ноября.

e.g. I was delighted to receive your letter of 20 January.

Я был очень рад получить ваше письмо от 20 января.

e.g. I am writing to tell you that I have decided to accept your offer of employment.

Сообщаю Вам, что я решил принять ваше предложение о работе.

e.g. Further to my last letter/ to our telephone conversation I am writing to tell you that...

В дополнение к моему последнему письму/ к нашему телефонному разговору сообщаю вам, что ...

e.g. We are interested in the new training programme.

Нас интересует новая учебная программа.

e.g. In reply to your letter of 9 January ...

В ответ на ваше письмо от 9 января ...

e.g. I am writing to confirm my wish to apply for the post of...

Настоящим сообщаю о своем желании подать заявление о приеме на должность.

The Concluding Paragraph is the last thing your correspondent will read, and the last impression you produced on him/her. It should also contain typical phrases of the kind:

e.g. I would appreciate any suggestions/ offers.

Я был бы признателен за любые советы/ предложения.

e.g. Thank you for your time and trouble.

Спасибо за время, которое вы мне уделили и взятые на себя хлопоты./ Спасибо за потраченное время и хлопоты/ внимание.

e.g. We would be grateful to receive a prompt reply.

Мы были бы благодарны за получение ответа в ближайшее время.

The Closing Salutation appears two spaces below the body of the letter. The most common complimentary close is 'Yours sincerely (BrE) or Sincerely yours' (AmE). More formal letters to high government officials might call for 'Respectfully yours'.

The Material Enclosed along with the letter is called 'enclosures' (usually shortened to 'enc').

2. Find in text 2 the English equivalents for the following key words and expressions.

1. структура, построение (письма)	
2. обратный адрес	
3. текст письма	
4. фирменный знак/ символ	
5. сокращения (в написании слов)	
6. получатель (письма)	
7. приветствие	

8. заключительное приветствие	
9. подпись	
10. «с уважением к вам»/ «искренне ваш»	
11. приложение (к письму)	
12. сообщение	

Speaking Practice

1. Find the answers to the questions in the texts 'Writing Business Letters' and 'Business Letter Pattern'.

1.1. Questions to the text 'Writing Business Letters'.

1. Why do people write business letters?
2. Is a business letter usually long and very formal?
3. Do you have to follow any rules while typing or composing a business letter on a computer?
4. What is the block format of a business letter?
5. What makes a business letter stylistically balanced?
6. What can create a favorable impression if you write a letter of application?

1.2. Questions to the text 'Business Letter Pattern'.

1. What does the heading of a business letter include?
2. Is there any deference in writing dates in British and American English?
3. In what way should you write your Russian address for a foreign correspondent?
4. If the greeting at the beginning of a business letter is 'Ms', what does it mean?
5. How does the greeting end in business letters?
6. What does the body of a business letter consist of?
7. Do you think the beginning of a business letter is very important? Why?
8. What do you usually write in conclusion?
9. What is the most common closing salutation?
10. What is the shortened form of the word 'enclosure(s)'?

2. Work in pairs. Discuss the content of texts 1 and 2 in the form of a dialogue using the sets of questions given below. Use communicative signal words (SW) and expressions for the questions and answers.

Question SW	Answer SW
First of all…	It is evident that…
Can you tell me…	We can state that…
It is interesting to know…	As for _____ we can say that…
I would like to ask you…	I am sure that…
Can I ask you…	To my mind/in my opinion…
One more question is…	It seems to me that…
Do you know…	I would like to say that…
Have you got any information …	If I am not mistaken…
How do you think…	Above all…

Writing Practice

1. Translate the following sample letter concerning methods and terms of payment.

1 Metalexport Ltd
43 Ulyanova St

109189 Moscow, Russia

2 23 January 2019

3 Mr James Bowers
Managing Director
Electroscan plc.
26 Orchard Road
Halifax HX2 5PJ, UK

4 Your ref. MS/SN 22/95
Our ref. 20/2009/95

5 Dear Mr Bowers,

6 Much to our regret we have to inform you that so far, we have not received a bank guarantee from you. In view of the above we would like to remind you of your letter of November 5, last year, in which you asked us to change the Letter of Credit (L/C) method as inconvenient owing to the difficulties and extra expenses incurred

7 Being aware of your difficulties our firm made a concession by suggesting payment for collection terms. You accepted the suggested method of payment and undertook to submit within three weeks a first-class bank guarantee for 80% of the contract value. However, as we are still without your bank guarantee, we have had to give instructions to suspend shipment of sheet iron. At present over 40 tons of sheet iron are at the port causing storage expenses which we feel should be charged to your account. We enclose herewith a list of current storage prices.

8 We would, therefore, be grateful if you could advise us at your earliest convenience when the bank guarantee will be submitted and also let us have your consent to covering the above storage expenses.

9 Yours sincerely,

10 Ю. Борисов
Yu. Borisov

11 Export and Sales Manager

12 Enc

2. Match the numbers standing for the parts of the letter with the English equivalents choosing the words from the box below.

References, date, concluding paragraph, signature, typed signature, position/title, enclosures, salutation, sender's return address, closing salutation, introductory paragraph, reader's name, position and inside address, main paragraph

3. Find English equivalents to the following Russian word combinations. Consultthesampleletter.

Закрытая (частная) компания с ограниченной ответственностью, аккредитив, принятые на себя расходы, к нашему сожалению, благодаря/по причине, открытая (публичная) компания с ограниченной ответственностью, предоставить подтверждение, расходы по хранению, условия платежа на инкассо, задержать отгрузку, в свете вышесказанного, расходы должны быть отнесены на ваш счёт, согласие на покрытие расходов по хранению, банковские гарантии, пойти на уступку, как только вам будет удобно, стоимость контракта, к настоящему (письму) прилагается.

4. Match the common abbreviations (A) used in business letters to their longer words equivalents (B).

A	B
1)& Co	a) trademark
2) @	b) Post Office Box
3) approx.	c) per annum (per year)
4) attn.	d) Incorporated
5) Corp.	e) at (a price of...)
6) dept.	f) copyright
7) enc. or encl.	g) Public Limited Company
8) etc.	h) Managing Director
9) Inc.	i) and Company
10) incl.	j) approximately
11) Ltd.	k) for the attention of…
12) MD	l) Limited
13) p.a.	m) reference (number)
14) pic. or p.l.c.	n) Corporation
15) POB	o) enclosures
16) ref.	p) registered trademark
17) ®	q) including/inclusive
18) ©	r) department
19) TM	s) et cetera/ and so on

5. Match the patterned business letter phrases and sentences with the content points of a business letter.

1. With regard/reference to your letter of 21/8/19…
2. If you don't pay a refund for ... I shall be obliged to take legal action.
3. I apologize for my delay in replying to your letter of 19/7/99.
4. I look forward to hearing from you soon.
5. I am writing in order to ...
6. I am writing in reply to your letter of 20/8/19.
7. We regret to inform you that your name has not been placed on our short list for the post of manager...
8. We should/would like to draw your attention to the fact that ...
9. I am writing to confirm my wish to apply for the post of...
10. I enclose my curriculum vitae (CV).
11. I would be very grateful if you would/could send me an application form.
13. We are interested in the new training programme.
14. We would be grateful to receive a prompt reply.
15. Failing this, I shall have no alternative but to refer the matter to my solicitor.
16. We apologize for any inconvenience you may have been caused ...
17. I would like to apply for ...
18. I am pleased to inform you that your application for ... has been approved.
19. Attached you will find a detailed account of what happened ...
20. Further to our conversation / my fax of 18/8/19 ...
21. Thank you in advance for your help.
22. I insist on an immediate apology ...
23. We should be glad, if you would confirm this booking as soon as possible.

24. I would like to confirm the booking made by phone today for a double room.
25. I look forward to joining your company.
26. I am pleased to accept your offer.
27. With reference to your recent letter I am instructed to inform you ...

1. Saying why the letter is being written.	
2. Referring to previous contact.	
3. Making a request.	
4. Sending something with the letter.	
5. Rejecting/accepting applications/offers.	
6. Looking forward to the reply.	
7. Threatening/expressing a threat against someone.	
8. Making an apology.	

2.2. Тексты делового характера для перевода и работы со специальной лексикой

1. Translate the text.
2. Make up the vocabulary of specialized key-words and expressions marked in the text.
3. Choose 5 specialized key-words or expressions and explain their meaning in English.
4. Prepare mini presentation on the content of a text given below.

Text 1. Contemporary Organization Theory

The literature on various contemporary theories of organization is vast. But perhaps the underlying factors most commonly found in almost all of them include the significance of external environment and its impact on organizations, the utility of managerial feedback, the importance of strategic planning and top managerial decision making, the role of technology and resource dependence, the necessity of worker cooperation, and the desire for a participative management, as well as a host of other variables representing managerial and individual employee perspectives. These theories reflected the post – World War II relative economic prosperity followed by the increasing social, political, racial, and economic conflicts, that dominated the periods of the 1950s and 1960s. Attention was shifted toward strategic, environmentally conscious, and globally motivated decisions with managerial innovations for meeting the ideological challenges of the Cold War period both politically and economically. Organizational planning was generally discouraged because of its being socialistic in nature, therefore restricting individual freedom of choice.

Text 2. Market Model of Organization Theory

The market theory of organization is derived primarily from economic theory and secondarily from sociology. Based on the neoclassical economic theory, the market theory is based on the economic, rational assumptions that man is a self-interested, rational animal seeking to maximize individual interests in the marketplace. Bargaining, exchange, and strategies to minimize transaction and exchange costs and to maximize benefits are central to the market theory of organization. Modern organizations are seen as rationalizing institutions of exchange and transactions of the free market system in which individuals trade and exchange their goods and services for something in return.

Mainly developed for application in the private sector, the market theory of organization and administration has found its way into public administration and organization theories.

Several principles form the foundations of the market theory, also called ‘public choice’ theory. These include individual choice as the basis for organizational or ‘collective actions’, individual preferences as expressions of individual choices, rules to facilitate and assure order and stability in organizations and society.

Text 3. Chaos Theory

The notion of chaos denotes crisis and disorder, a state of nonequilibrium, instability, turbulence, rapid or rupturing changes that scramble plans and cause unpredictability, with consequences of anxiety, fear of the unknown, and triggering effects of destruction and system breakdowns. A key question for social and natural scientists is how to control chaos so that its destructive effects could be eliminated or minimized. This is a notion that has until recently prevailed in traditional ways of thought and action in social science. However, as explained by chaos theory, social and natural phenomena do not exist or develop or evolve on strictly linear paths so that we can predict crises that would need to be avoided or controlled. The essence of chaos theory is that of the law of nature, as explained over a century and a half ago by Marx and Engels and long before them by earlier philosophers of the East as well as of the West. Examples of chaotic events or systems breakdowns in the world are many, and they may be found at macro and micro levels. Contemporary scientists have grouped these crises or systems breakdowns into two types: microcosmic and macrocosmic.

The microcosmic social realities of crises have worldwide impacts. Examples include financial crises, population crises, global environmental crises, world population explosion pressures, desertification of productive lands, crisis of the widening gap between rich and poor countries, and the possibility of nuclear wars, institutional crises, and a host of other crises. These crises and pressures ‘drive the breakdowns of systems that lead to states of social chaos’. These so-called ‘microcosmic’ crises or social breakdowns are considered short-term process events, with many more micro-oriented crises that affect open system organizations and living systems.

The second type of chaos-oriented forces that are long-term with accelerated shifts are macrocosmic. Macrocosmic crises are the great changes of history and acceleration of evolutionary forces that has led to disintegration, social shifts, and longwave crises that threaten the whole global planet, a fundamental concern of the future that calls for present decision and social action.

Text 4. Power Elite Model of Organization Theory

Shared objectives, values, wealth, and educational and social backgrounds hold the power elite groups together. There are extensive positional overlaps, interlocks, and interchanges among the uppermost elites. The executive cabinet members and top political elites appear to be centrally located, with legislators and high-level politically appointed officials taking secondary seats just below the first inner circle group. The first group of uppermost elites generally sets the broad parameters and boundaries of the political and governmental system, allowing the secondary level of non-inner circle elites to interact and function on the plural model. Should the secondary level elites step beyond the boundary limit, they will be subject to sanctions, including removal from membership.

Autonomy of the first elite group from the state is expected, and the state actually is dependent on this elite. Mills (1956) calls this group the ‘power elite’, whereas Hunter (1953) calls it the ‘power structure’, which conditions the structural parameters and their boundaries in society. This model can be applied to many countries in the developed and developing world, but it does not seem to apply to some, especially revolutionary societies such as Iran, Nicaragua under the Sandanistas, and elsewhere, where the lower middle

class, including members of the peasantry and some professional groups, actually governs the society and dominates the politics and administration, although the economic elite may still hold considerable bargaining power.

Text 5. Significance of Power Elite Model

The power of organizational elite theory is significant in several ways. First, the theory is descriptive. It not only explains the organizational power structure, it also explains the external power structure that more or less sets the parameters for organizational power and functions.

Second, the theory also focuses attention on what ought to be done by making suggestions regarding elite configuration and reconfiguration, elite recruitment from masses, elite benevolence, and elite decisions on strategic choices that affect both the elites and nonelites. Therefore, the elite theory of organization contributes to the normative theory of organization not only by building on descriptive aspects of organizational power, politics, and administration (e.g., how organizations function and who is in charge). It also considers alternative modes of power structure in organizations (what ought to be done or who can or should take power, or how power should be distributed).

Furthermore, by analyzing the existing situation, the elite theory attempts to predict possible outcomes of policy choices and to recommend corrective actions at strategic levels both inside and outside of organizations.

Organizational elite theory uses a dialectical approach as a method of analyzing organizations, the relationship between the leaders and the led, management and labor, and the elites and the masses, because without one the other is inconceivable. The dialectal process is a method of analysis of interaction between masses and elites, and between elites and counter elites at all levels of organization and society. Such dialectical interactions are key ingredients of the elite theory in general and of the organizational elite in particular. As long as the relationship between organizational members and elites is not antagonistic and hostile, elites are able to manipulate smoothly the environment under their control.

Text 6. Theoretical Approaches to the Public Sector Reforms

There are at least three alternative theoretical positions useful for understanding reform and reorganization efforts in the public sector. We will describe briefly these three fundamental positions, along with the various subsets contained within each. We will also discuss how each of the approaches might be applied in the public sector and how we might decide among them as ways of understanding what has been happening in public administration. There may even be a case to be made for the ability of several of the approaches to predict what might transpire in any prospective administrative reforms.

One major weakness in most public administration literature is the inability to predict the logical outcomes of emerging situations and opportunities in the public sector. As a consequence, most administrative analysts postdict rather than predict, outcomes in the public sector; these ex-post analyses will always be correct, but not particularly useful for the practical policymaker. The approaches which will be discussed here are by no means predictive models, but there are at least some inklings of movement in that direction.

As we discuss theories in reorganization, we will need to be extremely careful to distinguish the theories (implicit or explicit) that have guided practitioners who constructed the reorganizations from those theories that political scientists and other organizational analysts have utilized in their attempts to understand, ex post, the changes imposed. In some instances, the two bodies of theory may be synonymous, while in other cases there are marked differences. Several of the more abstract theories of the analysts may in fact be useful for informing practical reform efforts.

РАЗДЕЛ 3. БАНК ТЕКСТОВ ПРОФЕССИОНАЛЬНОЙ НАПРАВЛЕННОСТИ

3.1. Classic Cars – the History of Design and Technical Features

Источник: Герасимова Л.Ф. Автомобиль: учебное пособие на английском языке для студентов вузов, обучающихся по специальностям: 150200 – Автомобили и автомобильное хозяйство; 240100 – Организация перевозок и управление на транспорте; 240400 – Организация и безопасность движения. В 2 ч. – Омск: Изд-во СибАДИ, 2002. – 205 с.

Text 1. FORD

The founding of the Ford Motor Company was to have an importance in the field of motor cars, not only from the point of view of mass production and the philosophy of the car for the masses. Along with these revolutionary ideas, Henry Ford, creator, animator, and commander of the company introduced a number of other novel concepts. In particular, he believed that not only the largest possible number of people should enjoy the products of his factory, but also that the largest number of people should share in the material benefits created by the production itself.

The Ford Motor Company was founded on 16th June of 1903 with a capital of $150,000. Henry Ford became Vice-president and also assumed the post of Chief Engineer and General Manager. Among the shareholders were the Dodge brothers, ex-mechanics, who had opened a workshop in Detroit after having for some years manufactured bicycles of their own design. The beginning was not easy. There was strong competition from such established companies as Cadillac, Oldsmobile, Reo and Packard. Ford distinguished his models in a way which was unique in those days when other manufacturers were applying names intended to impress the public with the power of their engines or with some other characteristic that would appeal to the motorist's taste. He gave them single letters. This in itself was typical of his guiding philosophy in all things – simplicity.

The year 1908 introduced one of the most famous cars ever, the Ford model ‘T’, the ‘Lizzie’ for millions of Americans – the ‘Tin Lizzie’, as it was called by rivals in its early days, until its great commercial success made such criticism ridiculous. Its official birthday was 1st October 1908. That date represented the culmination of months and months of hard work by everyone in the organization. This time the ‘boss’ had decided that not only would the new model be technically perfect but that it would be the product of a manufacturing and commercial organization completely geared to mass the production and volume sales. What immediately struck the Americans who had waited for the launching of this new car with mounting curiosity was its apparent fragility. At first it appeared that thinness of the panels and the lightness of the chassis sections would make for short life and high maintenance. It was soon discovered, however, that considerable use had been made of vanadium alloy steel. Its superior strength made possible economy in the use of material, and gave major advantages from the point of view of weight saving. For the first time transverse springs, both front and rear, were used on this chassis and proved very satisfactory on the terrible American roads of that time. The extensive use of Steel for minor details of the car had considerable effect on its appearance – for instance, the extremely large but light mudguards, the running boards, and other parts. Innovations did not stop there. The easilyrated four-cylinder 2,880 c.c. engine (bore and stroke 95 mm. by 101 mm.) had a monoblock casting for the four cylinders, one camshaft and the valves on one side of the engine. The cylinder head was detachable, allowing easy access to valves and pistons for

attention. At first the h.p. was 20 (later increased to 22), a reasonable figure in such a light car. The power/weight ratio gave excellent result.

The most interesting technical features were in the ignition and transmission. Ignition was by means of a simple form of flywheel magneto. The revolutionary transmission system of the model 'T' was the work of Ford's own designers. It consisted of a simple and robust two-speed gearbox without the conventional clutch – made possible by the low maximum speed, power, and engine r.p.m. of 1,500 – which Ford had wisely insisted upon to ensure long engine life. The gear change was by foot pedal and quite foolproof. It will be appreciated, therefore, that to drive the model a number of unusual operations were necessary. These were the direct result of Henry Ford's policy of

To drive off in a model 'T' – once the engine was started – one had to press lightly on the gear pedal to disengage the transmission. It was then possible to release the handbrake, working on the rear wheels, the last few degrees of movement holding the 'clutch' out. With the brakes now off, the driver pressed the gear pedal firmly home, which engaged first gear through the 'clutch'. With the car accelerating, gentle pressure on the gear pedal engaged top gear. Stopping the model was simpler. The brake pedal was pushed and, at the same time, the handbrake applied, which also disengaged the transmission. There were two other ways of braking, to be used only in emergency. The first was to press on the brake and gear-change pedals simultaneously, thus also engaging first gear. For even more fierce braking one pressed simultaneously the brake pedal and a third pedal, which engaged reverse gear.

The second big American motor company, General Motors – for long the largest and most powerful commercial organization in the world was founded in 1908, the result of the patient, tenacious work of another outstanding individual, William Crapo Durant. He, like Ford, had begun in the early years of the 20th century but the aims and methods of the two men were quite different. Ford was in essence a technician, with clear, precise commercial ideal. Durant was a business man who, like other of the time, had seen the future possibilities of the car.

Text 2. GENERAL MOTORS CORPORATION

In the early 1900's Billy Durant, grandson of a Governor of Michigan, was already a millionaire, having founded a successful handcart factory with his partner, Josiah Dallas Dart, an ex-dealer in trinkets. These two decided to convert their factory in Flint to motor car production, Durant being particularly keen to do so. Their problem was to find a well-known business, preferably in financial difficulties, which their assistance could turn into a financial success. Buick fitted the bill.

David Dunbar Buick was in an ex-tinsmith, also from Michigan, who, having amassed a substantial fortune from his patents decided to build motor cars. His prototype for a light car created interest; it had a well-balanced engine, a pleasing appearance, and certain good technical details, notably pushrod-operated overhead valves. The financial aspects of the company, however, were not equally good. It was in this way that Durant, in November 1904, was able to get his hands on the Buick business. He immediately increased the company's capital from $75.000 to $300,000, and later to $500,000. He transferred the works to Flint, not to his own factory but to that of the Flint Wagon Works, another company with which he had recently become associated. The impulse that Durant gave to the Buick business is shown by the production figures; they passed from 28 machines, in 1904, through 626 in 1905, to 2,300 in 1906.

By 1908 Buick production was sufficient for Durant to consider his next step towards the motor industry throne that was clearly his ambition. Instead of buying another

motor company, he set up a much higher goal – nothing less than a trust to incorporate all, or at least most of the big American motor manufacturers, a trust with the then fantastic production of 50,000 units per year. Durant did not waste any time. He went so far as to found the new company first – General Motors with an initial capital of $12,500,000. This company was given the task of acquiring motor companies which found themselves in difficulty, including those manufacturing accessories. The first companies absorbed by General Motors had already been previously incorporated by the International Motor Co. They were Dow, Ewing Automobile, Carter Car Company, and Elmore, all of minor importance and forgotten today. To these were added the Western Mott, manufacturers of axles, and Champion, of enduring sparking plug fame.

A little later Durant conceived the most ambitious plan of his career – nothing less than the acquisition of Ford, for which he was prepared to pay the unprecedented sum of $8,000,000. With Ford's refusal, Durant's star began to decline. It was typical of American high finance in those years that the absolute faith that had made almost unlimited funds available to him was quickly changed into suspicion – of his ambition and of the scale of his plans – and then into open alarm. Wall Street turned its back on him, he was asked to resign, and was substituted by Charles W. Nash. He was made president of Buick after its purchase by Durant, and had led that company to unheard-of prosperity. It is not surprising that the shareholders saw in him someone who was capable of taking over – with a less ambitious and more realistic policy. We might add that this was by no means the end of Durant. Five years later, (in 1915) he was once more triumphantly at the head of General Motors, thanks to his success with a new name – Chevrolet. He was finally to leave the company in 1920 when another crisis made G.M. shares fall from $400 a share to $12. Even after this he was to figure largely in the activities of other new makes – Durant, Dort, Star and Mason – until the crisis of 1929 finally pushed him into obscurity. He died a largely forgotten man in 1947.

Text 3. MERCEDES-BENZ 300SL

Since Karl Benz's first bold experiment with internal combustion in 1885, Mercedes-Benz has maintained an eminence in the motoring world. The name is synonymous with quality, power and fine sporting tradition. Perhaps the great era for Mercedes-Benz began with the model 300SL and the 300SL began with the gigantic Mercedes-Benz 300 saloon launched in 1951. This top-class range of cars used a six-cylinder, 3.0-litre, overhead-cam engine with an alloy head and twin carburettors, plus such advanced features as an all-synchromesh gearbox, hypoid drive (the first German car to have this) and independent rear suspension.

It was a natural choice for Mercedes-Benz engineers to base a new sporting model on Mercedes-Benz 300. The chassis took form of two large cross-members joined by a lattice of smaller steel tubes. To achieve the necessary stiffness, the tubes had to run beside the cockpit and it was this factor which gave rise to the gullwing doors of the 300SL. A stressed aluminium body was designed by Karl Wilfert around the space frame. It was a coupe because this body type was believed to give the best aerodynamics. Surprisingly, the new racing coupe was given drum brakes, not discs. The 3.0-litre engine had to be inclined at 50 degrees to fit within the complex lattice of tubes, a new cylinder head was designed and dry sumping was used. There were also three carburettors, an uprated camshaft and a new exhaust, the net result was an output of 171 bhp which was very impressive for its day.

Thus, Mercedes-Benz entered sports car racing. With Rudi Caracciola, Karl Kling and Hermann Lang at the wheel, the team attacked the 1952 Mille Miglia. Kling came in second behind Giovanni Bracco's Ferrari V12. However, at the next race, the Swiss Grand

Prix, the 300SL scored a memorable 1-2-3 victory. After this crushingly successful competition record, the road-going version was eagerly awaited. It might never have happened had not the American Mercedes-Benz importer, Max Hoffmann, place an advance order for 1,000 cars. Some modifications were made: the body was substantially redesigned by Paul Bracq to become more aerodynamic and steel became the main material of construction (except for a run of 29 all-aluminium cars). The 3.0-litre engine's power and torque rose significantly and it was given Bosch fuel-injection – a pioneering step. 112 The suspension was modified to cure oversteer caused by the swing-axle rear, recirculating ball steering replaced the old warm-and-nut system arid proper heating was installed (though ventilation would always be a problem with the Gullwing). The new 300SL made its debut at the 1954 New York International Motor Show. It caused a considerable stir with its amazing gullwing doors, dramatic lines and advanced specification. The new Mercedes could do an amazing 145-160 mph depending on rear axle ratio, and reach 60 mph from rest in a little over 8 seconds.

But the 300SL was not perfect: entry and exit were decidedly awkward, the gullwing doors irksome to open, luggage space rather restricted and ventilation poor. Driving it required great skill, as it would snake as the driver floored the throttle and it still had a propensity for oversteering. A Roadster version had always been planned but, when it arrived in 1957, it replaced the Coupe rather than supplementing it. The claustrophobic and impractical Gullwing was frankly unsuited to American tastes and climate and, after all, Californians did buy most of the 1,371 Coupes made. The Roadster debuted at the 1957 Geneva Salon. It had a proper folding hood which disappeared into boot and the novelty of winding windows. The gullwings were replaced by conventionally-opening doors. Suspension modifications improved handling, the headlamps were restyled and the engine now developed between 225 bph and 250 bph. A removable hard top was offered from 1958 and four-week disc brakes were standardised in 1961. By the time 300SL Roadster production ceased in 1963, Mercedes-Benz had built 1,858 of them. There are few examples of a classic car, which is worth more in a closed coupe from than it is in convertible form. The Mercedes-Benz 300SL Gullwing is such a car. The magic, which it cannot fail to weave on all who set eyes on it continues today and examples can fetch extraordinarily sums.

Text 4. AC COBRA

Cobra... It is, in short, a legend. How can a car which was in production for a mere five years, and which sold only around 1,000 examples, achieve such legendary status? The story is all the more remarkable considering the Cobra grew out of a not particularly exceptional sports car, made by a tiny English firm by the name of AC, and its combination of a frail-looking ladder chassis and a brutish V8 power plant that was hardly subtle. One name provides the answer – Carroll Shelby. It was he who had the vision to mate the AC Ace sports car with an American Ford V8 engine and it was Shelby who actually screwed the cars together in his racing workshops in Santa Fe, California.

Shelby had heard that AC's engine supplier, Bristol, was stopping making the 2.0-litre engines used In the Ace sports car. He got in touch with AC Cars of Thames Ditton, Surrey, in 1961 with a suggestion: How about using an American-made V8 engine unit from a Ford Fairlane? The idea of purring an American V8 engine in a European sports car was not new but no one had dared to approach the heights to which the Cobra would ascend. AC agreed to try the idea. Amazingly, the Ace's very simple twin-tube ladder chassis was retained unchanged, although in-board rear disc brakes and a reinforcing frame for the rear suspension were fitted. At both ends, lower wishbones were combined with transverse leaf spring upper links and telescopic dampers.

Production of the Cobra got underway in 1962. The chassis and lightweight (22.5kg) aluminium body were hand-built by AC in Thames Ditton. Most of the road equipment was then fitted and shipped to California for final assembly by Shelby, using Ford engines, four-speed gearboxes and strengthened drive shafts. The Cobra first appeared on the Ford stand at the 1962 New York Auto Show, where it caused a sensation, an impact which was reinforced by a number of high-profile road test reports.

Sports Car Graphic described the Cobra as 'one of the most impressive production sports cars we've ever driven', adding that its acceleration was 'explosive'. Their official road test recorded the astonishing times of 0-60 mph in 4.1 seconds and the standing 1/4 mile in 12.9 seconds. Those figures can put to shame most current supercars, let alone the sort of machinery which was available in 1962. The secret of the Cobra's performance was not a massive power output – it had a 'mere' 260 bhp to begin with – but its light weight. The Cobra measured only 384cm long, so weight was kept down to 916kg, producing a power-to-weight ratio of 258 bhp per ton – better than the contemporary Ferrari Testa Rossa.

In America, the model was generally known as the Shelby Cobra but European markets always had cars badged as the AC Cobra, and later just AC 289 Sports. The advertising presented it as the perfect match of British styling and craftsmanship with American power and reliability. Right from the start, it was offered with competition options for owners who wanted to take their cars racing. Owners could buy roll hoops, racing seats, cut-down windscreen, extra vents and a whole host of engine options.

On the back of its racing pedigree, the Cobra sold well, especially in America. It was actually cheaper than the old Bristol-powered Ace had been, selling for around the same price as the poorer-performing Jaguar E-Type. Shelby was forced to move to bigger premises to cope with the growing demand. In alliance with Shelby, Ford itself managed many of the Cobra's problems. A lot of work went into balancing the chassis. Rack-and-pinion steering replaced the archaic worm-and-roller system. Then Ford offered Shelby their bigger 289 cu in engine. This was merely a stepping-stone to the ultimate Cobra of 1963.

Conceived as a giant-killing race-winner, it was essentially a Cobra fitted with a big block 427 cu in (6997cc) V8 from the Ford Galaxie 500. Two examples were completed with Paxton superchargers and claimed to deliver no less than a frightening 800 bhp. To cope with the extra power, the chassis was completely redesigned. The basic ladder frame layout remained but the tubes were far thicker and the suspension towers were now tubular affairs, not fabricated sheet metal. At last, the old leaf spring suspension gave way to coil spring dampers and double wishbones, refined by Ford Engineering to be fully adjustable. Larger brakes, beefed-up drive shafts and extra cooling completed the picture. The 427 also looked more muscular. Only the bonnet and doors stayed the same – everything else had been pumped up to accommodate much fatter 8.15in (207mm) tyres. One 427 managed to accelerate to 100 mph and back to zero again in just 13.8 seconds. Safety and environmental legislation killed the Cobra in 1968. AC tried to update the concept but this did not last long in the fuel crisis of the 1970s. All types of Cobra are extremely rare and desired, with prices well in excess of £ 150,000. Carroll Shelby himself launched a controversial new Cobra in the 1990s, which he said was based on chassis left over from the 1960s. However, none of the replicas could ever hope to match the raw magic of an original 1960s Shelby-built Cobra, one of the greatest motoring legends of all time and certainly one of the most exhilarating.

Text 5. ALFA ROMEO SPIDER

There can be no mistaking an Alfa Romeo Spider. The delicacy of its lines and its unique character could not have come from any other carmaker. Nor would any other manufacturer ever consider making essentially the same sports car for no less than 27 years.

Sports cars are normally a genre reserved for the cutting edge of car design. The truth is that Alfa Romeo never really needed to replace the Spider. It was always an intensely likeable car and it gained a passionate following of devotees, especially in America.

Few people could have realised the little Alfa sports car would become such a classic when it was launched in 1966 as the Duetto (duet), a name selected from hundreds of entries in a nation-wide competition. Alfa Romeo even gave away a new car to the lucky winner of the contest. The Duetto used the advanced mechanicals from the Giulia saloon, including the 1570cc engine in its most powerful (109 bhp) twin-carb, plus a five-speed gearbox and all-round disc brakes. It was very advanced for 1966. With its unmistakable long, flat, rounded tail, the Duetto was judged by the motoring press to be an outstanding sports car.

In Britain at least, it was rather too expensive to make much impact, as it cost almost as much as an E-Type Jaguar. After just one year, the engine was changed for a new 1779cc engine with 118 bhp on tap and the old Duetto name was dropped in favour of the Alfa Romeo 1750 Spider Veloce. In 1968, a short-lived 1300 Spider Junior was also launched, although that model is little-known outside Italy.

Visually, the biggest change to the Spider came in 1970 when the car's delicately rounded rump was replaced with a harder and prettier 'Kamm' style cut-off tail. A year later the engine was increased in capacity once more, to 1962cc, and output leapt up to 132 bhp. The early 1970s was undoubtedly the Spider's heyday: it was quicker, prettier and purer than at any other time in its life. Then it all fell apart. In Britain, it was decided that converting Spiders to right-hand drive was uneconomic and official imports ceased in 1977. If purchasers were keen enough, they could still buy a Spider through specialists, who would even convert it to right-hand drive if wished, but it was always a marginal product.

Then US law decreed that rubber impact bumpers and catalysts had to be fitted. Soon after, in 1952, the Spider's glorious twincarb engine was replaced by fuel injection, with its power down to a pale 115 bhp. In this fashion, the Spider lasted right up until 1990, when Alfa Romeo boldly decided to give the Spider one last chance of life with a major re-style by Pininfarina. The central bodywork remained the same except for some plastic sill covers, but the front and rear ends were heavily revamped. Most significant were the wrap-around body-coloured plastic bumpers front and rear, and the reshaped boot and rear wings. The engine was modernised with electronic fuel injection, variable valve-timing and a catalytic converter. Inside, the interior was considerably reworked. With this last breath of fresh air, the Spider lasted for two years.

Yet the Spider's appeal was remarkably durable. Spurred on by one of the most celebrated film appearances ever for a car, when Dustin Hoffman swept Katherine Ross off her feet in The Graduate, the American market became the Spider's mainstay during 1970s. Around 90 per cent of all Alfa Spiders were sold in the US during this time. From 1955, the base model Spider was even called the Graduate in America. Typically, Italian in style and in its uncompromising engineering approach, perhaps the Spider's best point was its silky sweet four-cylinder twincam engines. Like all sports cars, the Spider was a victim of advancing legislation, developing fuel injection and catalysts in response to American demands. It never lost its essential charm though. Indeed, in engineering terms it always remained firmly rooted in the 1960s.

The Spider remained convincing. Performance was lively and the sound from the exhaust was distinctively Alfa. There were wonderful design touches and the feel was of a very special car. That means that it inevitably became a desirable classic. There is no shortage of enthusiasts who appreciate the Spider's finer qualities. There is no shortage of people who remember The Graduate either. With the memory of its legendary Spider still fresh in the mind, Alfa Romeo presented, in 1994, an all-new Spider. However, it shared

only the name with its ancestor, as it was radically different in concept and design. Front-wheel drive is the biggest difference and the new car's modern styling sets the pace for rival sports cars. The new Spider promises a great future for Alfa Romeo's sports car tradition. As the company's 1980s advertising slogan boasted: 'The magic lives on...'

Text 6. VOLKSWAGEN BEETLE

No other car in history has attracted more people than the Volkswagen Beetle. When the Allied Forces evaluated the prototypes at the end of World War II, it was considered too crude, ugly and underdeveloped for production. Sir William Rootes even said that it 'does not meet the fundamental requirements of a motor car'. Necessity prevailed and the Volkswagen – or People's Car – was given life.

The Beetle's origins can be traced back to 1934, when Ferdinand Porsche 119 began work on Adolf Hitler's dream of a Volksauto. This was to be a four-seater, air-cooled car to cost less than DM1000 (around £50/$250). However, the car couldn't be bought for cash, only through a saving stamps scheme. Two prototypes were completed by October 1936 and, after further development, a factory was opened in 1938 to build the 'Kraft-durch-Freude Wagen' – the 'Strength Through Joy' car. Production never really began, since the war required that the factory was turned over to making the Kubelwagen – a military vehicle with the same mechanical basics.

After the war, Major Ivan Hirst was given the task of rebuilding the factory, which had been destroyed by Allied bombing. Among the ruins was found the remains of a KdF Wagen. The military advised that this should be produced as a means of supplying local light transport. So, a production line was set up – in appalling conditions at first – and supplies flowed to all of the occupying forces. It was felt that the Volkswagen, as it was now called, stood a chance as a regular production car – it was cheap and simple, ideal for those post-war years. Exports to France and Russia began in 1946 and civilian orders were being fulfilled within two years.

The basis of the Volkswagen was a backbone chassis/platform with a rearmounted, 1131cc, fiat-four engine, which was air-cooled to cope with severe German winters. Unusually for the time, it had four-wheel independent suspension by torsion bars. The simple steel bodywork bolted on top and because of its shape, it was nicknamed the 'Beetle' by the Americans. The early Volkswagens had split rear windows and very austere trim with no chromework. Export models were slightly more luxurious and technically more sophisticated. Early 'split window' Beetles are now treasured collectors' pieces.

No Beetle is more highly prized than the Volkswagen sanctioned only two official conversions. The sills, bulkhead and rear were all strengthened, so it felt very rigid. The original windscreen was retained, though the side windows and engine lid were new, and the hood could be raised with one hand. The second convertible Beetle was a full four-seater, created by Karmann of Osnabruck, which became the definitive item. Rigidity was addressed by adding members under the sills and around the doors, which pushed the weight up by 901b (40kg). Externally it was identical to a Beetle below the waist (except for re-positioned semaphore indicators) but there were new winding front and rear windows and an elegant fabric hood with glass rear window, which grew larger as the years passed. The hood stacked up high behind rear seats. Production of the Karmann Cabriolet ceased as late as 1980.

The first major change to the saloon occurred in 1953, when the rear window became oval-shaped and the engine increased in size to 1192cc, pushing power up from 25 bhp to 30 bhp. By the time the rear window changed again to its more familiar rectangular shape in 1957, sales in America were soaring. They were up to 64,000 that year and even-

tually peaked in 1970 at over 582,000 units. The Beetle's success was partly spurred on by an inventive advertisement campaign which played on the contrast of the Beetle's unchanging appearance versus Detroit's chaotic annual revisions. The Beetle was also widely viewed as the most reliable car around. Gradually things became a little more sophisticated, as the engines grew in size, the gearbox gained synchromesh, automatic transmission became optional and the improved 1302 Beetle came on stream.

Volkswagen, however, never lost sight of the attributes which endeared it to its owners: simplicity, value and reliability. On 17 February 1972, the Beetle passed the magic milestone of 15,007,034 units produced, overtaking the record set by the Ford Model T. That made it the most popular tar in history and its total is unlikely to be exceeded by any other single model. Even after German production ceased in January 1978, the Beetle continued to be made at factories in countries like Brazil and Mexico, where Beetles 121 are still being churned out at the rate of almost 500 a day.

The popularity of the Beetle has never waned. It is still viewed with tremendous affection and owners are often loyal to the point of fanaticism. This is reflected in fairly high prices for Beetles sold as classics, especially the convertibles. There has been a craze for customising. Young people attracted by the Beetle's time-less lines often spend large sums subtly evolving their cars. For instance, 'Cal-Look' Beetles smoothed out the lines, lowered the suspension and added wild and gaudy paint schemes. There is a strong case for naming the VW Beetle as 'Car of the Century' – indeed a panel German motoring journalist has already done so. It has brought affordable and reliable motoring to countless millions, not just in its home market, but in the United States, Australia, South America, Africa and across the rest of the entire globe and it will continue do so for some time to come.

Text 7. VOLKSWAGEN PASSAT

It's our most important new model since the Golf II, Michael Heelas, managing director of Audi Volkswagen in U.K. told at the press launch of the new Passat. It's our volume car for the 90s. It will move Volkswagen further up-market, to area's it has not been in before.

Previous Passats had the engine arranged longitudinally. In the new one it has been turned round positioned transversely to make better use of length, as in so many other cars these days. All engines are four-cylinder. For Britain, all are 1781 c.c. Huge boot space and ample rear-seat legroom have resulted from reacting the long coil-sprung struts of the trailing arms rear suspension against the outer corners of the parcel shelf behind the rear seats. For the estate car, however, this tall strut mounting requires towers that do intrude on the load-space. This careful bit of detail design is to diminish rear-induced oversteer without the expense and space occupation of a pan hard rod.

The Germans, anxious to minimise the effect of catalyser talk about it taking only about 5 per cent of the power output. The difference feels actually more like 15 per cent. The first Passat was with 2-litre 16-valve engine, and it certainly did not offer the sort of sparkling performance one expects of such development. The non-catalyser was with l.8-litre GL with simple Mono-Jetronic fuel injection into the inlet manifold centre and with just two valves per cylinder, yet it seemed to respond every bit as well as the more powerful model with four valves per cylinder.

A new feature of the Passat is that the gearchange is cable-operated. One might well groan, on hearing that, if one can remember cars like the Austin Maxi, in which the cable gearchange was imprecise, stiff and trouble; but the Passat application behaves quite satisfactorily, when new, anyway. It has a light action, and an exceptionally narrow gate, with very small separation between first-second and third-fourth planes of movement.

The seats of the Passat are comfortable, with lever-operated height adjustment – although this alters the angle of the cushion – that's why good visibility is ensured, scuttle line is fairly low and a windscreen well swept by the wipers which park at the base of the screen. Instrumentation is plain, but clear and the curved nacelle in front of the driver includes three ventilation outlets, while the radio cassette unit is mounted sensibly high up at the top of the console. Ventilation is regulated by rotary controls. Much talk is spouted by Volkswagen about its adoption of air blending temperature control instead of water valve. The inlet for the ventilation and heating system is taken from a well at the back of the engine bay, sealed from the engine fumes when the bonnet is down, but without any visible inlet grille.

Volkswagen claims a drag factor of 0.29 for the new Passat, to which no doubt the very neat flush glazing of the windows contributes. GT versions have a spoiler on the boot lid. Only two body styles are being offered, saloon and estate car: so, there is no hatchback, as there was for the previous Passat. Not just the front seats, but the rear seats adjust longitudinally and for backrest angle. Consequently, this must certainly be one of the most comfortable medium-range cars for rear seat passengers. As standard come such features as central locking with dead-locks (no one can open a door without a key, when the car is locked, even if a window has been smashed), and electric heating for the windscreen washers and the door mirrors.

The new Passat also promises to be economical, with all models topping 37 m.p.g. on the Transport Engineer formula, and the GT with Digifant injection reaching an impressive 39.8 m.p.g. The fuel tank is a special plastic moulding, holding 15.4 gal (70 litres). The VW badge in the centre admits air to the engine for combustion, while cooling air to the radiator is scooped up beneath the bumper. In many ways like these, the new Volkswagen Passat shows signs of careful thought in its design, and it looks set to do well, possibly even at some expense to the Audi 80, since it offers Audi merit without the restricted boot space.

Text 8. JAGUAR

Strictly speaking, the Jaguar marque, on its own, did not come into existence until 1945, for the original cars of 1931 were called 'SS', and a new range of car introduced in 1935 was badged as 'SS-Jaguar', but there was always strict continuity of design, and for more than 50 years the guiding genius behind the company, and its designs was Mr. (later Sir) William Lyons. Sir William joined forces with William Walmsley in Blackpool to build sidecars for motorcycles in 1922. The young Lyons, however, had a real flair for styling, and one result was that the little company began building special bodies for Austin Sevens in 1927. In 1928 the company was moved down to Foleshill, Coventry and announced the SS1 in 1931.

Like other early SS models, the SS1 used a special chassis frame, side – valve six-cylinder Standard engines, transmissions and suspension components, and coachwork styled personally by William Lyons himself. There were 16 h.p. and 20 h.p. models, and the cars gave remarkable value for money. In due course, the SSII, with smaller four-cylinder Standard engines and running gear, was announced. The first major change came in 1935 when the company took a major step towards becoming a complete maker of cars. William Heynes was hired to design a new chassis frame and suspensions, while Harry Weslake produced an overheadvalve conversion of the six-cylinder Standard engine. The whole was clothed in a truly elegant, four-door saloon body style, and sold at the remarkable price of f 385. There was also a slightly cheaper side – valve 1.5-litre model. All were badged as SS-Jaguar.

In the next four years many improvements were made to the range. In 1937 the company produced an overhead valve 1.5-litre engine (four-cylinder) and a larger 3.5-litre overhead – valve 'six', while at the same time converting the car's coach-work to all-steel construction. Much more exciting, however, was the short-chassis car, with a two-seater sports body. This was the SS100, available with 2.5-litre or 3.5-litre six-cylinder engines. The prices of all SS – Jaguars were reasonale, and the looks attractive, so it was no wonder that sales rushed up to more than 5000 cars a year in 1939.

After the war, in which the factories produced important items like aircraft wings and fuselages, the company dropped the 'SS' part of its title, and became, simply, Jaguar cars. At first, only the prewar models (except for the SS100, which was never revived) were available, and there were no new models until 1948. In the meantime, Jaguar, still with Heynes as its technical chief, was working on a brand-new series of twin-cam engines, one of which remained in production until the Eighties. In 1948, Jaguar astonished the world by showing its new XK120 sports car which not only had the new engines (a 3.5-litre 'six', and a 2-litre 'four' (which never went into production), but a new independent – suspension chassis, and startlingly attractive body lines. The same basic chassis design, but in long – wheelbase form, was also to be found under the skin of the new Mk V saloons and coupes. It was not until 1950 that Jaguar revealed the Mk VII saloon, for which the new chassis and engine had originally been intended, and it was these saloons, and the sports cars, which were the company's mainstay until the mid-Fifties.

Jaguar's post-war successes were even more obvious in export rather than in home-market territories, for the cars soon built up a formidable reputation. It was not only the sheer performance of the cars, which was so remarkable, but the amazingly low prices at which the cars could be sold profitably. The company's spectacular rise upset the balance of the specialist car market and hastened the demise of several such concerns. During the Fifties Jaguar became involved in world-class sports car endurance racing, building limited numbers of C-Type, D-Type and XKSS two-seater models, and the factory team was victorious at Le Mans race on no fewer than five occasions (1951-53-55-56-57).

By the end of the 1970s, Jaguar had survived shock after shock. Not only had there been two oil price shocks, which tipped the balance against thirsty, large-engined cars, but the market for large cars in North America (one of Jaguar's traditionally strong sales territories) had also dropped alarmingly. But in spite of all the predictions, the VI2 engine was still in production as one of the most refined, technically advanced, and powerful engines in the world, and the company's morale had completely been restored. By 1983, Jaguar was not only building and selling more cars in a year than for the past decade but demand in North America was at a new peak. With new models and new engines, the mid-eighties looked like being an exciting period for Jaguar.

Text 9. LOTUS ELAN

The true depth of Colin Chapman's engineering genius is still being discovered. He developed an unsurpassed reputation for designing race-winning cars and became pre-eminent among British race car constructors. Chapman realised the need to develop road cars which would fund his true passion, motor racing. However, despite levels of performance Lotus road cars were almost always deficient in build quality. The Elan changed all that. By 1962, Lotus Elan had become the dominant force in virtually all singleseater racing categories and there was a strong demand for a road car which embodied the Lotus principles of light weight and efficient engineering.

After his experience with the glassfibre monocoque Elite model, Chapman realised that what he didn't need was another difficult-to-make, expensive, semi-racing car. Anoth-

er glassfibre monocoque design was ruled out, so instead Chapman used a backbone chassis. This idea was not new but the method of its construction was. The Elan didn't use a steel tube type chassis but a folded pressed steel sheet forming a single girder. The lightness and rigidity of this set-up so impressed Chapman that he began using it on his Formula 1 cars. Soon all Fl constructors had copied him. The backbone split at the front into a two-pronged fork embracing the engine/gearbox and leading to the front suspension. The suspension was by front wishbones, coil spring/dampers and an anti-roll bar, using proprietary parts where possible. The rear was independent by struts and coilsprung wishbones. Disc brakes were fitted all round.

As for the body, this was a glassfibre open structure which contributed little to the rigidity of the chassis. It was a one-piece shell which bolted to the chassis and featured pop-up headlamps, which were a great novelty at the time. Overall dimensions were very compact and the first Elans were strict two-seaters. They were all initially open-topped, although an optional hard top was offered from May 1963. The Elan was launched at the 1962 London Motor-Show at £ 1,499 complete. Thus, it was not a cheap car but it was certainly one of the most desirable sports cars of any description in 1962.

Lotus launched the Elan with a 1498cc twin-cam engine based on the Ford Cortina block. When the international racing class was raised to 1600cc, Lotus expanded the engine to 1558cc. In this definitive form, the engine developed 105 bhp enough for 115 mph and 0-60 mph in 8.7 seconds. There were many early problems, like flaking paint, poorly fitting trim and criticisms of the rubber doughnuts on the drive-shafts, which were quickly replaced with superior Rotofiex joints. Engine noise at high speed was also a concern, which was remedied in 1965 with the option of a higher final drive ratio.

In late 1964, Lotus introduced a Series 2 version incorporating larger brake callipers, a better interior and optional centre-lock wheels. The Series 3 of the following year had an extended boot lid, higher final drive and could be ordered as a fixed-head coupe as well as a drophead. The 1966 SE (Special Equipment) became the best Elan to date, boasting a 115 bhp engine, close-ratio gearbox and servo-assisted brakes. The final Series 4 version (1968) had flared wheel arches, rocker switches and was available, from 1971. Lotus built special racing versions with lightweight bodies and modified suspension to improve roadholding, which were called 26R.

There is a second chapter in the Elan story. Chapman launched another road-going Elan in the form of the 'Plus 2', or family man's Lotus. This was first introduced in 1967. The primary reason for the existence of the Elan +2 was to provide an extra pair of seats for children up to teenage years. In concept and layout, it remained very much an Elan but it was larger in every way. The backbone chassis idea was kept but it was bigger. To compensate for the increased bulk, holes were drilled in the steel to reduce weight. The bodywork was still glassfibre but it was substantially enlarged, gaining a foot in length and 7in. in width. It was substantially redesigned, featuring a new sloping nose, much larger boot and fastback roof. The interior was also improved, having a more comprehensive dash. Mechanically, the story remained much the same, although the +2 became the first Lotus to gain a standard brake servo. The same 118 bhp 1558cc twincam engine was used. Although the weight penalty over the standard Elan was considerable (46.8 cwt/850 kg to 14 cwt/710 kg), performance did not suffer too badly, probably

In 1968, the family Elan was uprated to +2S specification, gaining better trim and more equipment, such as fog lamps. The final metamorphosis came in late 1972, when a five-speed gearbox was offered as an option. By 1974, changing type approval regulations made it uneconomic to continue producing the Elan.

Text 10. VOLKSWAGEN GOLF GTI

In the early 1970s Volkswagen was becoming drastically out-of-step with the rest of the car world. While virtually every other manufacturer had abandoned rear-engined cars as second-best from the point of view of both dynamics and packaging, Volkswagen insisted on producing a range based entirely on the prewar Beetle. Volkswagen's new partner Audi was already ahead with its range of smart-looking, well-built, front-wheel-drive saloons. However, Volkswagen embarked on a spectacular, revolutionary rebirth and in the space of two years, from 1973 to 1975, it launched no less than four allnew front-wheel-drive cars: the Passat, Scirocco, Polo and Golf. Each one of them set new standards in their market sectors.

The most successful of the quartet was unquestionably the 1974 Golf. The name derives from the the German word for the 'Gulf Stream'. In America, where the new car would also be manufactured, it was known as the Rabbit. The Golf's styling was the brilliantly simple work of Italian independent design team. The packaging was exactly right, the hatchback tail made it extremely practical and the build quality endeared it to a generation of owners who had known only rust and breakdowns. Some of the engineers at Volkswagen were convinced that the car Volkswagen had conceived as a shopping trolley for the masses could handle much more power.

The balance of the front-wheel-drive Golf was so good that there certainly was plenty of potential to handle it. The management at the Wolfsburg headquarters was not convinced and would not sanction work on what it saw as an uncommercial product. So, technicians developed a rather special version of the Golf in their spare time, until the management finally liked what they saw and gave the project the green light. This was destined to become the GTI.

The most important changes happened under the bonnet. The largest engine in the intended new Golf line-up was a 1588cc unit. It was to this unit (which developed 75 bhp in standard tune) that the engineers turned. They installed Bosch KJetronic fuel injection and boosted the power up to 110 bhp. The engineers also tweaked the suspension, adding a front anti-roll bar to stiffen it tip, while fat wheels and tyres were specified to sharpen grip. The marketing department decided on an understated style: the simple clean-cut lines of the Giugiaro original were left unchanged, only a deep chin spoiler, discreet side stripes, a little bit of red trim around the grille and an unassuming 'GTI' badge made the car stand out.

Quite simply, the Golf GTI caused a sensation with the motoring public in 1975, who was eager to own one, even though it took almost a year for deliveries to begin. In the first four years of the model's life, more than 100,000 were supplied to customers on the continent. In Britain the GTI was only sold to special order, in left-hand form, for four years. It was not until 1979 that the GTI became available in right-hand drive, by which time the original four-speed gearbox had been replaced by a five-speeder. British customers soon realised what they'd been missing. The GTI was a genuine firebomb, capable of over 110 mph and 0-60 mph in well under ten seconds. Moreover, this power was delivered smoothly and reliably.

The magic of the original Golf GTI and those three letters came to be synonymous with the new driving subculture. Another significant newcomer in 1979 was the Golf Cabriolet. This was actually another brave and pioneering move, for at that time convertibles were very much out of fashion. The engineering and construction work was done by the acknowledged masters of the convertible art, Karmann of Osnabruck. Their model was typically Germanic in execution: there was a roll-over bar and a high-stacked hood, to keep as much boot space as possible, although both luggage space and room in the rear seats was at a premium.

Another important derivative of the Golf was the Scirocco, Volkswagen's coupe which shared the Golf platform. Naturally there was a GTI version of this too, mimicking the specification of the Golf but adding performance through lighter weight and better aerodynamics, as well as offering attractive coupe styling. A larger 1760cc engine became standard for the Golf GTI in 1982, which boosted power slightly to 112 bhp. This made the GTI a much more tractable than many rivals. A hotter 139 bhp 16-valve version followed.

The Mark 1 Golf was replaced in 1983 by the second generation, and that in turn by the current Golf in 1991. All the time the GTI badge remained a stubbornly popular component of the Golf family. Amazingly, the original Golf Mark I bodyshell lasted right up until 1992 in convertible form, when it was finally replaced by the current Golf Cabriolet. Few would deny that the Golf GTI even today is still entertaining new generations with its delights. Thousands were imported to Britain, which is good news for the bargain hunter today. The Golf was so well built that many cars lasted the distance where other, more fragile performance cars bit the dust. Today, the GTI has a wide following and many examples have been restored.

Text 11. JAGUAR MARK II

When a luxury car-maker like Jaguar decides to expand its market into the cheaper compact saloon car category, other manufacturers should quake in their boots. Britain's established producers certainly felt the impact when a new 2.4 litre Jaguar was launched in 1956. The car simply was a huge leap forward from the expected standards of the day. In the 1950s, Jaguar had already become Britain's leading high-class saloon manufacturer, being very successful with the Mk VII, which remains a very underrated car even today. What it created was not only its first-ever chassis-less monocoque design, but an attractively modern-looking compact luxury car with searingly good performance and roadholding. That reputation was enhanced by the arrival of a faster 3.4-litre version in 1957. These 2.4 and 3.4-litre saloons became known retrospectively as the Mark I up till 1959, and after that, the Mark II.

Collectors and enthusiasts have recognised the fact that the Mark II has become the classic Jaguar saloon. Perhaps it is the elegance of its styling. Perhaps it is the old-world charm of its traditional leather-and-walnut interior, leaping cat mascot and oval chrome grille. Compared with the old Mark I, the Mark II looked much more balanced and delicate, having a larger glass area, slimmed-down pillars, more chrome and a wider rear track. The latter point meant that the full rear spats of the Mark I were replaced with cutaway ones. The interior was also superior, having exceedingly comfortable leather seats, masses of walnut veneer and a sporting feel to the dashboard layout. The big news was the availability of three configurations of the six-cylinder engine: the 2.4 and 3.4-litre units which had already been used in the Mark I, and the spectacular 220 bhp 3.8-litre engine from the Mk II.

Racing drivers also recognised its worth. Jaguar's works drivers Mike Hawthorn and Duncan Hamilton were two of the more celebrated owners of 3.8litre Mark IIs. Another profession that appreciated the pace and space of the Mark II was the British police force, making it a frequently seen pursuit and motorway patrol car. Export markets were naturally targeted, the most important being America, where journalists had voted the Mark II 'Car of the Year'. The Mark II was given a spectacular showing at the I960 New York Show, with an example having all of its exterior metalwork gold-plated, and a model dressed in a gold-thread dress stitched with over 1,000 diamonds!

The Mark II remained largely unchanged throughout its production life (1959-67) but there were a number of interesting derivatives. The first was the Daimler 2.5-litre V8 which was given birth because Jaguar had acquired the Daimler company in I960 and inherited the fabulous Edward Turner-designed Daimler V8 engine. Ironically, it was actually a much better performer and handler than Jaguar's smaller-engined Mark II.

Another derivative was the Jaguar S-Type, which used the Mark II's hull and interior largely unchanged, but added a longer tail and slightly revised front end. This was in turn developed into another pair of identical twins, the Jaguar 420 and Daimler Sovereign, which had sharper front-end styling and 4.2-litre engines.

The Mark II officially died as a model in 1967, the last ones having cheaper interior trim, in line with a general cost cutting policy at Jaguar in the late 1960s. However, there was a pair of final runout versions of the Mark II which were called the 240 and 340. They were made between 1967 and 1969. These were considerably less lavish models with slimmer bumpers and plastic interior trim.

In the 1980s, the classic car market began to acknowledge the Mark II as a quality car with enthusiast value. Prices rose to extraordinary heights – beyond £ 30,000 in some cases – and, unlike many other classic cars, did not fall back dramatically in value. However, all Mark IIs are not equally valued. The 3.8-litre version with a manual overdrive gearbox is unquestionably the best and consequently the most sought-after. The 2.4-litre Mark II and down-market 240/340 models are at the opposite extreme, with automatic transmission also frowned on. Likewise, the Daimler V8-powered versions are generally viewed with far less enthusiasm because they are not pure Jaguars and were conceived more for comfort than rewarding sports driving. As a result, Daimlers can make the best buys because they cost so much less. A veritable industry has sprung up to support these cars and there are even businesses doing very well updating original examples to more modern specifications, for what seem enormous sums of money. The attractions of running a classic as an everyday car have seldom been as powerful as they are with a Jaguar Mark II. The Mark IIs remain one of the great classic cars for as long as there are enthusiasts around to drive them.

Text 12. FORD MUSTANG

Alongside the Chevrolet Corvette, there is perhaps no car more truly American than the Ford Mustang. In terms of sheer sales, it is unrivalled among mass-produced cars. Mass-produced it certainly was, being the fastest selling car in history, notching up a million sales in under two years. The Mustang was a real trailblazer. In the US, coupes are even referred to as 'ponycars' in honour of the Mustang. It was the start of the craze for 'personal coupes', affordable sports-type cars designed to reflect the individualistic tastes of Americans. The man behind the Mustang was Lee Jacocca. He reasoned that there was a market for a sporty-looking four-seater that was cheap to build and could sell for under $2,500 (just over £600). The very first Mustang, seen at car shows in the early 1960s, was nothing like that: it was a small, two-seater sports car made of fibreglass - not what Jacocca had in mind at all.

The real Mustang was created by Ford's styling studio and was the work of Joe Oros, David Ash and Gale Halderman. Three body styles were conceived: a convertible, a hardtopped coupe and a pretty fastback 2+2 coupe. If the styling was advanced, the mechanical package played it safe. Because the Mustang was meant to be a cheap car, the power range started with a basic six-cylinder 170 cu in (2788cc) engine. It developed just 101 bhp, enough for a meagre top speed of only 90 mph. Optional was the 260 cu in (4260cc) V8, whose 164 bhp powered the car to over 100 mph. Gradually, Ford introduced a policy of

‘Total Performance’, spiralling power outputs of its big block V8 engines up beyond 300 bhp (a high point of 390 bhp was reached in the 1968 line-up). Ford sold the Mustang as a car ‘designed to be designed by you’. In other words, the basic car really was basic, and the customer would then select options from a huge list of possibilities, like automatic or manual gearboxes, column or stick shifts, handling packages, disc brakes, power steering, bucket or bench seats, air conditioning, interior trim packages and so on.

The Mustang arrived in April 1964, too late for the ’64 model year and too early for ’65. So, Ford's marketing department called the Mustang a ‘1964 4/2 car’. The public went wild. One East Coast dealer sold a car this way and the owner slept in his car overnight to ensure it wasn't sold from under him until his cheque cleared!

The Mustang was extensively restyled for the 1969 model year. An extra four inches were added to its length, it gained an extra pair of headlamps, the sides were ‘de-sculpted’, the rear arches were smoothed out and a new luxury version called Grande was added. The most exciting news for 1969 was the launch of the fastback, which boasted a 250 bhp V8 engine, stiffer suspension, a special front grille and a black bonnet with an air scoop. If buyers really wanted more power, though, the best place to turn was Carroll Shelby' s Los Angeles factory. He took near-complete fastback Mustangs and fitted them with 306 bhp 289 engines with high-lift camshafts, fourbarrel carbs and free-flow exhausts. They also got stronger axles, fibreglass bonnets and were almost always painted white with blue stripes. The most fearsome models were the GT500 of 1967 with its 428 engine (for an advertised 355 bhp but probably more like 400 bhp), and the mighty GT500KR (King of the Road) with up to 425 bhp.

Ford responded to the success of the more powerful Shelby Mustang with its own version in mid-1969, and called it The Boss. Based on the Mustang which was successfully dominating Trans-American race series, these had 290 bhp small-block V8 engines, chin spoilers and aerofoils. More powerful was still the Boss 429, sporting Ford's hemispherical combustion chamber and alloy-head Cobra Jet engine, whose power output went as high as a formidable 375 bhp.

A lack of interior space was addressed in the second major restyle of the Mustang, which was launched ready for 1971. This added yet more length and width, and significantly more weight, to the detriment of performance and fuel economy. The second major restyle of the Mustang was beginning to rely on fancy trim packages and colour options, like the Sprint package (white paint with red-edged blue stripes). For the final year of production of this trial-blazing first edition of the Mustang (1973), federal law insisted on the fitment of impact bumpers, rubber-covered switch gear and emissions-restricting equipment, which also strangled power outputs. In the last year of production, the original Mustang sold a paltry 135,000 units. As Ford's design vice-president, Eugene Bordinat, admitted: ‘We started out with a secretary’s car and all of a sudden we had a behemoth’.

The Mustang's 1973 successor, the Mustang II, was a very different car, no less than 20 inches shorter and 4 inches narrower than its predecessor, and some 500 Ib lighter. Also, there was no V8 option to begin with, simply an 88 bhp four-cylinder or 2.8-litre V6. The third-generation Mustang arrived in 1978 and lasted for the next 15 years, and the current Mustang is still demonstrating a very successful sales record.

Nothing, however, could ever match that first 1964 Mustang. For the bravery of its lines, the ‘must have’ factor it inspired, and the dizzy heights of performance it reached, there really has never been an American car to match it. That is very much reflected today in the high values placed on sound, original examples. If car enthusiasts want to own one of the Shelby Mustangs, they can expect to pay more than the price of a brand-new Jaguar. For most people, it’s the classic all-American shape of the Mustang which inspires such

enthusiasm. Paint it white and add some blue striped down the middle and anyone could imagine they are Trans Am racer! The Ford Mustang was not just a car; it symbolised the entire youth culture of America during the 1960s.

Text 13. ROLLS ROYCE – SILVER SHADOW

Although it sells a tiny number of cars in comparison to the world motor market-place, Rolls-Royce has come to represent something quintessentially British. It trades off its reputation as the best car in the world, although in most respects it is nowadays out-classed by many cheaper cars. But there is one thing which no-one does better than Rolls-Royce: the sheer craftsmanship of a Roller remains unparalleled.

It is difficult to identify the best Rolls-Royce of them all. The Silver Ghost was certainly the best car of its day; the post-war Silver Cloud was a statement of elegance and the confidence of the old British Empire days; and the Phantom was the most opulent and expensive car in production for decades. If car experts judged a model's success by the numbers it sold, then the Silver Shadow was Rolls-Royce's greatest car, selling over 30,000 in its 15-year lifespan. In many ways, it was revolutionary for Rolls-Royce: it was their first car to do away with a chassis, it did not have the snoopy, antique curves of all the previous models, and its specification looked very modern by comparison. Rolls-Royce claimed the new car was ‘as revolutionary as the Silver Ghost was 59 years ago. It possesses more individuality and advanced engineering than this company has ever displayed before in a new model’.

The Silver Shadow cost £ 6,556 when it was launched in 1965 – three times as much as a Jaguar and just about the most expensive car on sale. For their money, Shadow drivers were rewarded by a Rolls-Royce which broke new ground. There was more interior space, even though the overall dimensions were reduced. The body construction was monocoque, so the weight was reduced and the 6230cc V8 engine was able to deliver better performance. The company never discloses such figures but independent testers measured the new Roller at a 118-mph maximum with 0-60 mph coming up in just 10.9 seconds. Just about everything on the Shadow was power-assisted, including the triple-circuit brakes, steering, seats and windows. There were disc brakes all round, too (the first time ever in a R-R) and standard four-speed automatic transmission with finger-light electronic control. The legendary Rolls-Royce ride reached new heights of excellence, thanks to a new all-independent suspension system mounted on subframes. The biggest development in this department was a self-levelling system, produced under license from Citroen. Naturally, passengers were impressed by leather upholstery and woodwork, split-level ventilation (or optional air conditioning), cigar lighters (front and rear), folding picnic tables adjustable arm rests and even little foot rests in the rear.

The Silver Shadow may not have been the best-handling car but it was certainly very respectable among large luxury cars of the time. Perhaps its best quality was the effortless way it would travel long distances without tiring the driver. The silence inside the cabin was uncanny and the ride quality gave the impression of floating on air – which was virtually what passengers were doing thanks to the pneumatic suspension system! The only problem concerned feeding it: 12-16 mpg was typical, so owners needed a fat wallet – though this was not a great concern for most Silver Shadow owners.

Rolls-Royce wanted to continue its tradition of offering coachbuilt bodies and asked James Young to design their own two-door bodywork. James Young's route was to follow the lines of the Silver Shadow very closely. A long-wheelbase model was launched in 1969, which was distinguished by a full vinyl roof and optional glass division between

front and rear passenger compartments. More improvements followed: the engine grew to 6750cc in 1970 and there was a new Silver Shadow II in 1977. The Shadow II included body changes such as rubber-faced bumpers and a chin spoiler, plus interior improvements (new seats, re-styled facia, and standard split-level air conditioning), while on the mechanical side there were twin exhausts and rack-and-pinion steering.

By the time the Silver Shadow left production in 1980, when it was replaced by the all-new Silver Spirit and Bentley Mulsanne, it had become easily Rolls-Royce's best-selling model. A total of 31,189 Silver Shadows and 2,436 Bentleys T Series had been made. It also formed the basis of two other Rolls Royce models, the Corniche and Camargue. In classic car terms, the large numbers sold have been good news for enthusiasts. With so many examples to choose from, prices have dropped dramatically – so much so that it became possible to buy one for less than an 'ordinary' new car. Private motorists were attracted by the best build quality and the finest materials in the world, unbeatable levels of comfort and refinement, enjoyable road manners, long-lasting mechanicals and, of course, the prestige of running a car with that famous flying lady mascot. The negative side however, was the expense of servicing, the very high cost of replacement parts, the fuel bills, the complex mechanicals which are entirely unsuitable for DIY maintenance, and the 'jealousy factor' – Rollers are prime targets for vandals.

The Silver Shadow occupies a unique position as a classic car. It is dynamically much better than earlier Rolls-Royces, yet has less romance than the old-style coachbuilt carriages, so it falls between two stools. The result is that it has become that rare ideal for the motorist – a genuinely affordable, classic Rolls-Royce; an ideal that is finding increasing popularity with those who thought owning a Roller was nothing but a pipe dream.

Text 14. CITROEN

In spite of using identical power units, Peugeot and Citroen are managing to build cars with individual characters. First, Citroen launched its 16-valve BX GTI; now the same engine with four valves per cylinder becomes available in a range-topping Peugeot 405, the Mi 16, assembled in Coventry. The declared power output is 160 h. p., exactly as in the Citroen installation. With side skirts, deep front air dam, and a wing on the boot, Peugeot says it has been able to reduce the drag coefficient of the 405 saloon to 0.30. The maximum speed – always coveted, if seldom usable – is raised to an impressive 137 m.p.h. with acceleration to 60 m.p.h. in 8.5 seconds.

Part of the drag reduction has come from partially blanking the radiator grille, since the deeper front air dam creates extra suction behind the radiator. The side skirts are to improve cross wind stability, and the aerofoil wing at the rear reduces tailend lift at speed. As with the engines that power most of the 405 range, the capacity of the Mi 16 unit is 1.9 litres. Block and head are both aluminium. The double overhead camshafts are belt-driven, and the same belt also turns the water pump. The cams are directly over the valves, which are surmounted by bucket tappets. A water-to-oil heat exchanger is in the lubrication circuit, which is served by an oil pump driven by chain from the nose of the crankshaft. Ignition and petrol injection are by Bosch. The Mi 16 is available only with manual transmission.

Rather boldly, Peugeot says the gearbox 'is sealed for life', but advises an oil-level check every 35.000 miles. Compared with other 405s, firmer suspension is fitted. The aluminium wheels have 195/60 low-profile tyres. This is the first production car, says Peugeot, to be fitted with the third-generation anti-lock brake system. It is unusual in having an electric 220w pump to generate hydraulic boost pressure. Sensors in the wheel hubs feed data to a computer, and the system controls application of the disc brakes at all four

wheels by means of pressure solenoid valves. Additional equipment for the Mi 16 over the previous top-specification 405, the GTX, includes special seats with adjustable side supports, and automatic temperature control for the heating and ventilation system. Air conditioning will be optional.

Text 15. MITSUBISHI

Following its launch of an entirely new Galant saloon earlier 1988, Mitsubishi has added two more models, one of which is a turbocharged 1.8-litre diesel. Mitsubishi's diesel is a four-cylinder engine with twin counter-rotating balance shafts for added smoothness, though the benefit seems less noticeable than on the higher-revving petrol engine. The unit is transversely mounted and inclined forwards by 10 deg to allow longer inlet-manifold tracts. There is the usual slight delay in turbocharger response, but the engine spins up quickly to diminish the effect. Turbocharged diesels can be slower to start, but Mitsubishi fits what it calls a 'super-quick-glow' system to give prompt starting with less pre-heat time. The turbocharged diesel's maximum power is 74 h. p., giving a top speed of 101 m.p.h. and acceleration to 60 m.p.h. in 14.5 sec. The appeal of the Mitsubishi is boosted by the unlimited mileage three-year warranty included as standard.

The Galant is, at £10.799, quite expensive, but used on high-mileage work should offer low overall transport cost in relation to its size and carrying capacity. It is comfortable, has excellent instruments and a full specification, which includes seat-height adjustment. Fuel consumption on the Transport Engineer formula is 41.5 m.p.g. Standard equipment includes power-assisted steering, central locking, and pressure jet headlamp washers. For £500 extra, there is an option pack that includes electric window-lifts and sunroof. Air conditioning is available at £1.000 extra.

The second new Galant model has a four-valve head 2-litre twin overhead-camshaft engine, which Mitsubishi claims to be the first twin cam engine to have needle-roller bearings in its rocker arms (so has the diesel). This engine also has twin balance shafts. This petrol-injection engine develops 143 h. p. at 6.500 r. p. m. It can run on either leaded or unleaded petrol without adjustment. The Transport Engineer fuel consumption is 33.4 m.p.g. The tank on all Galants holds 13.2 gai (60 litres). A top speed of 128 m.p.h. is claimed, with acceleration to 60 m.p.h. in 8.6 sec. The power-assisted steering has electronic control that reduces the assistance as the car goes faster. The price of the 2000 GTi-16V is £13.199 plus £1.000 for anti-lock brakes, or £2.000 for both that and air conditioning. Mitsubishi evidently believes that anyone who can afford the extra cost of air condi-
155 tioning should also be able to run to anti-lock brakes, so the one is not available without the other. Central locking and electric windows are standard.

Text 16. ROVER

Until 1988, all models of the Rover range have featured engines with fuel injection and four valves per cylinder; but with addition of a hatch-fastback range Rover deepens the choices down the price spectrum with a two-valve, carburetted, 2-litre engine - the same one used in the 2-litre Montego. With this engine, which can run on 95-octane unleaded fuel, the Rover 800 loses some accelerative power, but for most conditions it is adequately lively.

The power output is 100 h.p. and it is delivered at only 5.400 r. p. m. The carburetter embodies effective automatic mixture control for cold starting. The transmission ratios and final drive have been kept the same as those of the other four-cylinder models; in cruise conditions one can tell hardly any difference from the fuel-injected models. The other

hatchback Rover 800 models are parallels to the existing saloon range. There is the four-cylinder engine with four-valves per cylinder, single-point fuel injection and 120 h. p. There is the multi-point fuel injection model with 140 h. p.

However, there is an extra top model in the fastback range – the Vitesse, identified by a rear aerofoil and by sill mouldings, giving a slight reduction in drag coefficient, to 0.30. This makes the Vitesse slightly faster: w

ith a fivespeed manual gearbox, it can just reach 140 m.p.h. – a marketing rather than a practical statistic, perhaps, but there might be a little benefit to fuel economy, especially considering that the tyres for the Vitesse are extra-low profile 205/60 instead of the 195/65-15s on the other models. Unlike the Sterling, which has automatic transmission as standard and a five-speed manual gearbox as a no-cost option, the five-speed is standard for the Vitesse, with the Honda four-speed automatic box as the no-cost alternative. The hatchback tail is ingeniously contrived as a direct development from the saloon, with the tail-lamp units fixed and the opening diving down to bumper level between them. The big sloping tailgate is strongly gas-strutted to counteract its weight, lifting the hinged rear part of the back shelf as it goes up. Like the boot of the saloon, the tailgate is self-locking. It can be opened either by the key or by a remote electric switch on the floor near the driver (the same electric release is now adopted for the saloon range). The large back window has a wiper and washer jet, with programmed action.

Perhaps Rover is convinced that for a hatchback to be used with one section of the seat folded down and luggage overflowing forward from the load space the rear seat is not divided. It folds as one piece for maximum load capacity, extending the floor length to 5ft 9in. Much is sacrificed to styling appeal; the rear slope does not provide much stacking height. The total Rover 800 series line-up now includes 14 models, and some of the new features of the hatchback carry over to the saloon. The interior door trim is improved. The electric window switches have been repositioned in the console. Anti-lock brakes become optional for all models (they are standard on the Sterling). A revised gearbox comes in for four-cylinder versions, with first and second gears lower, and fourth and fifth slightly higher. Self-levelling suspension is optional on all 2-litre saloons, and on all hatchbacks except 820 and Vitesse (which has sports suspension).

Text 17. FIAT

Bold design incorporating several features normally the preserve of much larger and more expensive cars, is seen in Fiat's new small car called Tipo, which in Italian means Type. Sales in Britain start in July. Success came to Fiat with its fresh approach in the Uno mini, and bravado is clearly expected to work again with the Tipo, the short-overhang rear-end styling of which certainly exhibits the shock treatment. But Fiat asserts that there is sound practical sense in it and that the strange rear quarter windows give a bright interior, a good view out for rear passengers, and help the driver when reversing.

Most significant of all, and calculated to create a better reputation for anticorrosion protection, is the use of galvanised steel for all the exterior panelling and some interior of the shell, totalling 70 per cent. Wheel arches have plastic liners. For smooth air flow the underway of the body is largely flat, with all reinforcing members inside the car. Then the front window frames of the doors overlap the pillars and continue into the roof. Roof guttering is replaced by a double seal inside the top of the doors. The windscreen is flush bonded, and side windows are almost flush with the outer skin. At the rear, the tailgate curves right round the corners, and opens down to the bumper, its complex shape being made possible by forming it in thermosetting polyester.

Initially, the Tipo is made only as a five-door hatchback, and it has choice of three petrol engines: 1108 c.c., giving 56 h.p.; 1372 c.c. and 72 h.p.; and an 83 h.p. 1580 c.c unit. All have cogged belt-driven single overhead camshaft. There are also two diesels: a turbocharged 1929 c.c. giving 92 h. p. will be available in Britain from launch: and the importers are also considering a 'fleet hopeful' 1697 c.c. non-turbo 58 h.p. unit. The engines are transversely mounted and drive the front wheels. A completely new five-speed gearbox has been developed with an emphasis on a lighter and more precise gearchange. The suspension is independent all round, with Mac Pherson struts at front and, at the rear, a shallow layout with trailing arms having squat coil springs above them. The arms pivot on a subframe comprising two longitudinal bearers bolted to the body and joined by a transverse rube. Unusual on a small car is the option of power assisted steering with the non-turbocharged diesel model and all but the 1108 c.c. petrol-engine ones. Power steering is standard on the turbocharged diesel, for which there is also the option of anti-lock brakes. Although a wide range of options is listed, the model palette has been simplified by offering just two levels of trim: standard, and Digit.

For the turbo diesel – which is evidently regarded as top of the range in Italy, where diesel cars are so popular – and for the 1580 c.c. petrol model, only the Digit trim is available. Features of the Digit specification include the controversial one of digital instrumentation. Other Digit features are electric front window lifts, central door and tailgate locking, halogen headlamps, and two-tone horn.

All versions can have an optional sliding sunroof (electric on Digit), and headlamps wash/wipe (Digit only). Air conditioning is also offered for all Digit models except the 1100. The rear seats fold flat for extra luggage space, after first tipping the cushion forward: but a divided rear seat is provided only as an option, available for any model. Perhaps Fiat questions how often this feature really is needed and used. A new approach to interior design is taken in the fitting of most minor controls on the two column-mounted stalks. Such switches as rear fog lamps, rear wiper and washer, heated rear window, and the four-stage wiper switch, are all on the stalks.

Fiat says this gives the advantages that everything can be reached with the driver's hands still holding the steering wheel, and that it eliminates unsightly blanks for switches not fitted on a standard model. If the prices are acceptable, the promised low running costs and bold equipment and option levels might tempt buyers and bring Fiat back into the volume section of this area of the market.

Text 18. PEUGEOT 405

'We will be top of the diesel market in Britain', predict Peugeot managers, on adding two diesels to their 405 fleet-car range. The indirect-injection four-cylinder diesel engines are 1.9-litre developing 69 h.p. at 4.600 r.p.m. and a turbocharged 1.8-litre (1779 c.c.) engine with intercooling delivering 89 h.p. at 4.300 r.p.m. The obvious question is: 'Why not turbocharge the 1.9-litre?'. The not very convincing answer is that there is not room under the bonnet to get rid of the heat, with the larger engine in turbo form. More likely to do with firing stresses, piston temperatures and water-jacket volume.

Both new diesels are notable for their smoothness and quietness, to such extent that one is little aware, when driving, that a diesel engine is under the bonnet, beyond the usual limitations of power and response. The 1.9-litre performs quite well, and is able to cruise at around 85 m. p. h. in relaxed style; but shortcomings remain in acceleration and hill climbing, which are relieved by the more powerful turbocharged version. For a 1.8-litre diesel this big car performs well, and delay in turbo response is short enough to be no hindrance.

The 1.9-litre non-turbo is derived from the existing Peugeot XUD9 unit, and identified as XUD9A with revised aluminium cylinder head with ram-pipe induction to obtain more oxygen at the higher speeds. Power is up by 5 h.p. and although torque is no higher, it stays high over a wider range, from 2.000 to 3.000 r.p.m. For the 1.8-litre there is either a KKK K14 or Garrett T2 turbo-charger, generating 1.3 bar pressure at 1.500 r.p.m. rising to a maximum of 1.8 bar. The aluminium heat exchanger that constitutes the induction-air intercooler is mounted on the camshaft cover. Higher gearing is used for the GTDT, as the turbo version is named, providing 100 m.p.h. in fifth at less than 4.000 r.p.m.; and it is indeed able to cruise surprisingly quietly at this speed. Its ultimate speed is 112 m.p.h. The 1.9-litre is geared for 22.5 m.p.h. per 1.000 r.p.m., and its top speed is 102 m.p.h.

It is interesting that the fuel consumption at constant speeds is declared as identical for both diesels with figures of 45.6 m.p.g. at 75 m.p.h. and 61.4 m.p.g. at 56 m.p.h. Only in the urban cycle does a small difference (40.4 instead of 37.7 m. p. g) emerge in favour of the normally aspirated engine.

Apart from announcing the diesel 405 models, Peugeot is also introducing an automatic transmission option that is basically Z.F. Apart from very expensive models such as Mercedes-Benz and the Rover 2.7, it is one of the most impressive automatics – responsive, well-chosen change points and smooth action. In addition, there is torque converter lock-up to give fuel and noise savings when cruising in fourth, and partial lock-up (60 per cent mechanical drive) in third. The automatic transmission becomes available for the 1.9-litre carburetted engine in a few weeks time, and with fuel-injection petrol engines from mid-August.

An interesting refinement of the transmission, which helps to avoid the sluggishness of many automatics is that it changes down from fourth to third on deceleration at about 30 m.p.h., and goes to lower gears as required ready for snappy acceleration. The top speed is 114 m.p.h. for the carburetted model, and 120 m.p.h. with injection. The fuel consumption on the Transport Engineer formula is 34.9 m.p.g. for the carburetted engine, and 32.5 m.p.g. for the fuelinjected one.

Text 19. MAZDA

Japanese designers have ceased to be copiers: indeed, they have become leading innovators. Mazda's new small car, the Mazda 121, reflects the philosophical change. Although the main concept of a small car with transverse engine and front-wheel drive is conventional enough in modern terms, a detailed look reveals fresh slants on old problems.

Unusual is the combination of electric action with a sliding framed-canvas type of sunroof, which is offered as an extra at £700. This provides a huge opening almost Citroen 2CV style, yet by using modern aerodynamics it has been possible to provide a car that can be driven fully open without wind buffeting. German material is used for the folding roof, which is laminated with a p.v.c. layer for elasticity, and has a triple sealing joint between the frame and the suntop material. The sliding action stops at any point when the operating switch is released. If the sun top is ordered, the radio/cassette unit fitted as standard will automatically be of lift-out type so that it can be stored away from the car and not be an inducement for thieves to slash the roof open.

The power unit is the Mazda B-Series four-cylinder with single overhead camshaft and small combustion chambers that are said to give better thermal efficiency. Tournament-type intake manifold tracts achieve a more even mixture distribution. To reduce internal friction, the engine has thinner piston rings, slim valve stems, small rocker shafts, a lightened flywheel, and a trochoidal-geared oil pump driven directly off the crankshaft. Many designers fit a warning light to remind the driver that the choke has been left open

after a cold start. Mazda goes one better than this, and fits a magnetic choke, which cancels automatically as soon as it is no longer needed.

To make the rear suspension compact, Mazda has used a torsion-beam axle with trailing arms – a cheap means of providing lateral rigidity and combining anti-roll properties (an arrangement first made popular by Volkswagen). To afford more flexibility in interior accommodation, the backseat is mounted on runners like the front ones. If only children are being carried in the back, a lever is raised to allow the seat to slide forward about four inches, making extra space available for luggage. The back seat is divided centrally, although the cushion is in one piece. When the rear compartment is unoccupied, the seat can be folded together scissors fashion, and tipped forward to the vertical giving huge extra luggage space. Many cars can match that, but few have the Mazda's clever facility for both front and rear backrests to fold flat, with headrests removed, making a passable emergency bed.

Poor features of the new small Mazda are the rather thin upholstery used for the seats, tending to become uncomfortable on quite short journeys, and the rather obscure instrument marking, in orange on black, which does not show up as well as might be expected. With this original new baby car, Mazda hopes to capture many new, younger customers, whom they will try to retain as they graduate to bigger and more expensive cars. It will cost £6.149 in the form as tried, with 1.3-litre engine, or £5.499 as a 1.1.

Also, although it may seem extravagant use of valuable Japanese import quota to introduce a small car, Mazda has its eye on a not-too-distant time when the Mazda121 will be firmly established on the market and will then become sourced from South Korea, when it will by-pass the quota restrictions – well, as constituted at present, anyhow.

Text 20. FERRARI 250 GTO

The seven letters of the name ‘Ferrari’ produce a quickening of the pulse for any car enthusiast. If you're a dedicated Ferrari fan however, just the three letters GTO are all it takes to get the adrenaline pumping. The GTO is THE Ferrari -and perhaps THE car of all time. Why is the GTO so special? There are several compelling reasons. Firstly, the GTO helped Ferrari win three World Championships in a row from 1962 to 1964. Yet it was a real rarity, a racer that could be driven on the road. On top of that, only 39 were ever made. That makes the 250 GTO ultradesirable whichever way you care to look at it.

To understand the GTO, car enthusiasts have to realise why it was conceived. Racing during the 1950s had become very much faster and consequently more dangerous. The death of 82 people at Le Mans in 1955 was the catalyst which split top-flight racing into categories. One of these was the new grand tourer class, which required that cars should have closed coupe bodies which resembled to a large degree those of the manufacturer's road cars. A minimum of a hundred examples of each of these race cars had to be built.

By the beginning of the 1960s, Enzo Ferrari's were dominant in racing, so he took the new class very seriously. He certainly faced some stiff competition from the Aston Martin DB4 Zagato and the new Jaguar E-Type. Ferrari's competitor was the 250GT, the first volume-produced Ferrari. It used the same basic chassis as that of the 166, first seen in 1947, which provided excellent handling. However, the 250GT was not strong on all-out speed. Enzo thought that he could beat the opposition with a more powerful engine but Chief engineer Carlo Chiti argued that the car's blunt aerodynamics were at fault. He went to great pains to have a wind tunnel installed at Ferrari's HQ in Modena. The result was that the engine remained much the same as before: 3.0-litre V12 unit designed by Gioacchino Colombo. The size of each individual cylinder was 250 cc, hence the ‘250’

name. Ferrari developed a new five-speed, all-synchromesh gearbox but the chassis remained much as before but with a short wheelbase.

Standard 250GT suspension used coil springs at the front and the rigid axle with leaf springs at the back. Development engineer Giotto Bizzarrini wanted to up-rate the rear to coil springs as well but Enzo did not agree. The new car arrived in February 1962 and was named 250GTO, the magical letters standing for Gran Turismo Omologato (which means – ‘a car allowed to race’). Each car was virtually hand-built, mostly for very wealthy private individuals who fancied their chances at a racing career.

The styling was gorgeous, the work of Ferrari's own engineers. It made use of the Kamm tail principle, which yielded enhanced aerodynamics for cars with sloping tails. Overall, the GTO was 6.6 inch longer and 3.5 inch lower than the short wheelbase 250GT Berlinetta. Construction was very lightweight, with all aluminium bodies created in Modena workshop of Sergio Scaglietti. The body

As a race car, the 250GTO was highly successful. From its first outings it proved its superiority over the opposition in endurance events and the World Championship. Phil Hill came second in the 1962 Sebring, the GTO's debut event. In the hands of drivers like Mike Parkes and the late, great Rodriguez brothers, it made Ferrari dominant on the track. In Class III of the 1962 championship, Ferrari GTOs won a crushing victory with maximum points - despite the Italian giant not having an official works team. Its only competition came from the lightweight Jaguar E-Type (from 1963) and the AC Cobra (from 1964). A single 4.0-litre GTO was developed and raced by Parkes and Mairesse at the 1962 Nurburgring 1000km. Ferrari scored a spectacular success at the 1962 Paris 1000km, occupying the first six places, four of which were GTOs.

Not only was the GTO a racing success, it could also be used on the road. As expected, handling and raw performance were exemplary. Car enthusiasts might not, however, have expected it to be a tractable and usable machine, especially in town - but it was. The downside (from the point of view of someone wanting to use it as a road car) was difficult braking, uncomfortable accommodation, droughts and the sheer level of noise.

The 250GTO was the last of a long line of great front-engined racing Ferraris. By 1963, the mid-engined 250LM had arrived and would show the way ahead: its potential for ultimate handling balance tended to place it ahead of the GTO. The new car would effectively have rendered the GTO obsolete immediately, but racing officials refused to sanction it because too few had been made to satisfy homologation.

Today the really fanatical Ferrari collector simply must have a GTO in his or her garage. However, that person will certainly need to be extraordinarily rich: the going price for a 250GTO is around the 2.5 million. For that a car enthusiast could buy seven brand-new Ferrari F50s. In Britain, several music business personalities have bought GTOs, though the cars are very seldom seen in public because of their stratospheric value. One side-effect of this situation has been the widespread replication of the GTO. Quite a few standard 250GT Ferraris have been butchered over the years to make replicas. Some have even been passed off as original, a process encouraged by the confusion over chassis numbers. More recently (in 1984), the GTO name was revived for another very special homologation car, the mid-engined 288GTO - but that, as they say, is another story.

Text 21. TRIUMPH TR4/TR5/TR6

The name Triumph has always been associated with sporting cars, from the glorious pre-war dropheads to the delightful V8-powered Stag of the 1970s. The pinnacle of Triumph's car building was the long run of true sports cars bearing the initials ‘TR’... and in particular the classic TR4, TR5 and TR6. The first TR, the TR-X of 1950, was to have

been a handsomely aerodynamic, up-market two-seater, but only three prototypes were made before the idea was abandoned.

The first production TR was therefore the TR2 of 1953. This simple and practical two-seater was very lively, and was the cheapest 100 mph car around in the 1950s, selling for just $2,500 in the USA, where enthusiasts lapped it up. Compared to the archaic MG TF, which was its main competitor in those days, it looked smart and modern. The improved TR3 brought the battle for American sales right to MG's door, fighting for number-one spot with the MGA. The TR3 lasted from 1955 to 1962.

However, the Standard-Triumph group was in dire financial straits by the turn of the decade. It was losing $ 600,000 a month and might have died had not the British truck-maker Leyland stepped in and bought the company in 1961. It promptly fired most of the directors and embarked on a 'new era', targeting North America with a strong export drive. Spearheading that drive for exports was the new TR sports car, the rebodied TR4 of 1962. The smart new set of clothes was designed by the Italian coachbuilder Giovanni Michelotti. Triumph was obviously impressed and asked Michelotti to style the TR4 and every Triumph for the next ten years. The TR4 was a foot longer than the old TR3, the 3inch wider track made it look lower, while at the same time improving stability and handling. The 'hooded' headlamps were a distinctive feature. With full doors and winding windows, the TR4 was also a lot more comfortable than the TR3, which had cut-away doors and simple side screens. The cockpit was certainly much roomier and plusher than the outgoing model, and featured face-level ventilation. There was also a novel optional extra called a Surrey top. This was a half-hard top, where the rear section remained fixed and the central part of the roof could be lifted out and replaced by a canvas top.

Underneath the attractive steel bodywork laid essentially the same chassis as the old TR3. That meant a separate chassis, rigid rear axle with leaf-spring suspension, front disc brakes and a four-speed manual gearbox (with optional overdrive). The main chassis advances for the TR4 were standard servo brakes and rack-and-pinion steering in place of the cam-and-lever type. However, perhaps the biggest change for the driver was an expanded version of the four-cylinder engine. In the TR4, it had grown from 1991cc to 2138cc. The power output remained the same at 100 bhp, but the engine had a wider power band and much better torque. Compared to the old TR3, it was also faster, capable of reaching 110 mph and doing the 0-60 mph sprint test in just over ten seconds. The smaller 2.0-litre engine remained available, however, because there was still a strong competition class for sub-2000cc engines. The TR4 proved a popular choice for rally drivers. Triumph's works team scored a string of class wins through the 1960s and fielded TR4s with success in the Alpine Rally and at Le Mans.

The TR sports car scored a real hit: production trebled between 1961 and 1964, going from under 3,000 units to over 9,000. An improved version called the TR4A arrived in 1964, whose main difference was the adoption of a superior coil-spring and trailing-arm independent rear suspension. This had a negative effect on overall weight (pushing it up by 100 Ib) but handling was much improved. Any performance loss due to the extra weight was countered by raising the engine's power output slightly to 104 bhp.

By this time, Triumph was also experimenting with the idea of fuel injection – the first British manufacturer to try it. It decided to use the TR as its testbed for a new fuel-injected version of the six-cylinder engine from the Triumph 2000 saloon. The capacity was raised to 2.5 litres and, despite the larger capacity and extra pair of cylinders; the new engine was a comfortable fit in the TR engine bay -and no heavier than the old 'four'. The new injection technology for the Triumph TR5, was launched in 1967. Early examples were rather temperamental but the injection system was quickly sorted out and customers

were soon enjoying the pleasures 150 bhp could bring 120 mph and 0-60 mph in 8.8 seconds. Other mechanical improvements included bigger brakes and stiffer suspension.

The American market version was known as the TR250 and could be identified by its contrasting stripes over the car's nose. The TR5 and TR250 were short-lived (lasting only one year) but they were good sellers. The model was replaced in 1968 by the TR6, basically a TR5 restyled front and rear by Karmann of Germany. The seats were new and buyers got a front anti-roll bar, but underneath it was basically the same TR story as ever, now beginning to look rather antique. The power units were the same, too, with the 104 bhp version remaining in the USA (although European customers were subjected in 1972 to a drop in power from 150 bhp to 124 bhp). The TR6 died as late as 1976, the last of a long string of 'real' Triumph sports cars in the traditional sense.

The TRs may not always have been very refined but their muscular character and handsome shape continues to endear them to tens of thousands of owners today. Apart from the MGB, the Triumph TR series is probably the most popular classic sports car in the world, as numerous Triumph owners' clubs can testify.

Text 22. MINI (Part 1)

After nearly 40 years in production, the Mini has become a much-loved and much-respected model. It was a pioneer in the art of transverse-mounted engines and front-wheel drive. It was a marvel of packaging and a testament to the conquest of technical barriers. It was, quite simply, a revolution when it was launched in 1959. Five million Minis later, it remains in production, satisfying a loyal following of owners for whom its size, cost and above all character remain compelling even today.

Over the years it has become a cult object across the world, from Carnaby Street in the 1960s to Tokyo in the 1990s. Perhaps the most remarkable thing about the Mini is that it was the brainchild of one man: Alec Issigonis. The Mini was probably the last mass-produced car designed by one man alone; as such, it is unlike any other car seen since.

The birth of the Mini took place against the backdrop of the 1956 Suez oil crisis. For all anyone knew, there might be an indefinite shortage of oil. British drivers were rationed to ten gallons of petrol a month. The popularity of bubble cars mushroomed. The British Motor Corporation's chairman, Leonard Lord realised there was a potentially huge market for a cheap small car which combined economy with large-car characteristics. To whom could he entrust the task of developing such a car? There was one obvious but brave choice: Alec Issigonis. Born in Smyrna in 1906, Issigonis had come to Britain to study at the age of 15. When he had finished his education at Battersea Technical College, he worked for Humber. Then he joined Britain's leading manufacturer, Morris, in 1936. This was where he met Leonard Lord, on a team designing suspensions. After the war, he conceived the Morris Minor. Then Leonard Lord asked Issigonis to begin development on a new small car project in 1957, which assumed the title ADOIS. Assembling a small team around him, Issigonis created the Mini.

The essential factor for the new small car was that it should carry four adults in comfort, plus their luggage. Issigonis became obsessed with the need to save space. He was fervently in favour of front-wheel drive; this mechanical layout could save all the space needed for the propshaft and final drive by incorporating it at the front. From the start, he knew this was going to be right for the Mini.

As for the engine, on grounds of cost, the obvious choice was the A-series unit, as found in the Austin A35 and Morris Minor. The trouble was, this power train measured 38 inches from stem to stern and this, in Issigonis's view, would eat up too much space. Then

Issigonis had a leap of the imagination. What if the gearbox could be placed under the crankshaft, instead of behind? The engine and gearbox would effectively become one unit and could be mounted sideways, driving each front wheel.

The lubrication problem could be overcome by plumbing the gearbox into the engine, so it could use the same sump oil. Issigonis felt that the A35's 803cc engine would not provide the performance and smoothness which the new car would require. So, the decision was taken to expand the A-series engine to 948cc. On tests, the engine gave the little car too much performance – it was tested to beyond 90 mph with only 37 bhp on tap. So, the engine was taken back down to 848cc and top speed fell to a less frenetic 74 mph.

Issigonis was always strongly in favour of small wheels; the 14in wheels of the 1948 Morris Minor were easily the smallest of any saloon of its day. The Mini went much further: its ten-inch diameter wheels were far and away the smallest used in any car, except for some tiny microcars which used scooter wheels. The sole reason for such small wheels was a sacrifice to packaging. They freed up more interior space by reducing the intrusion of the inner wheel arches. The main disadvantage of ten-inch wheels was the harsh ride they gave over rough surfaces. Here again Issigonis was ahead of the objectors. From his days with Morris, when he had got together with Alex Moulton to build a rubber-sprung Morris Minor, Issigonis had become a convert to the idea of rubber suspensions, which Moulton was still working on. The Mini's rubber cone system was so effective that it is still used on the car today.

All the major components – engine, gearbox, suspension, steering – were mounted on one subframe at the front, with a further subframe at the back to carry the rear suspension. This eliminated a lot of vibration too, and would prove invaluable in the development of a wide range of Mini derivatives which could use these subframe assemblies completely unaltered. Keeping costs to an absolute minimum meant accommodating such measures as exposed seams in the bodywork to allow easy spot-welding of the main body sections, exposed door hinges simply bolted to the main hull and elaborate door handle mechanisms.

Text 23. MINI (Part 2)

By August 1959, the most important car in BMC's history was ready to be launched. It arrived in two versions: the Morris Mini-Minor and Austin Seven (though the latter soon became just ‘Mini’ as the word pervaded the English language). Apart from the Ford Popular, it was the cheapest car on the market. It caught on with city drivers who liked its park-ability and with the fashion conscious who thought it ‘cool’. Widespread acceptance of the revolutionary Mini followed.

The Mini was also fantastic to drive: nippy, sharp-handling and manoeuvrable. Formula 1 World Championship constructor John Cooper realised its potential and persuaded BMC to let him develop a Mini-Cooper in 1961. With a bigger 997cc engine, it developed 55 bhp and could reach nearly 90 mph - amazing performance for such a small car. The Cooper's legendary reputation really grew with the 3d version of 1963. This had an ever-larger engine (970cc, 1071cc or 1275cc), front disc brakes, wider wheels, even twin fuel tanks. In its most powerful 1275S form, it was capable of a top speed of up to 96 mph and 0-60 mph in 11.2 sees.

Coopers were all-conquering in rallying, their undoubted high point being three outright victories in the Monte Carlo Rally in 1964, 1965 and 1967. It could have been four wins in a row, but the entire Mini-Cooper team was controversially disqualified on minor lighting regulation in the 1966 event. They were pretty successful on the tracks, too. The Mini could humble the more powerful Jaguars and Ford Cortinas with its fantastic han-

dling. The Mini Cooper S was not slow itself; on fast circuits such as the famous Belgian Spa track, Minis could top 130 mph.

The adaptability of the mechanical subframe package led to numerous Mini derivatives: estate, van and pick-up, utility Moke, luxury 'booted' Riley Elf and Wolseley Hornet. It also became a popular basis for customisation and special bodyworks. Mini became a marque in its own right in 1969 reaching a height of 318,475 units in 1971. The Mini is easily the best-selling British car of all time.

Recently, the Mini received a new lease of life thanks to numerous special editions with names like Open Classic, Red Hot and Piccadilly. Most exciting is the new generation Mini Cooper, launched in 1990, with its 63 bhp 1275cc engine and luxury trim. The popularity of the Mini shows no sign of abating, though Rover has announced plans for a brand new Mini for 1999. Sir Alec Issigonis summed up why the car has never been overtaken as the small classic: 'Small cars all look the same because they are designed by committees trying to copy the Mini'. That may sound arrogant but the Mini's brilliant and innovative formula of front-wheel drive, mechanical subframes and unique packaging certainly was the benchmark which others still follow today

Text 24. AUSTIN HEALEY 100 & 3000

Donald Healey was a Cornishman who set up his own marque immediately after World War II to make a series of handsome sports cars, convertibles and saloons. Considering they were fresh designs in troubled times, they were amazingly advanced. In fact, the Healey was the world's fastest four-seater in its day, capable of over 110 mph. In 1949, while travelling to America on the Queen Elizabeth, Healey chanced to meet George Romney, general manager of US car-maker Nash. They got on so well that a deal was struck, with Healey supplying complete body and chassis units to Nash, which would install its own engines to create the Nash Healey sports car.

This collaboration for the American market only did not prove to be a great sales success. So, in 1951, Donald Healey and his son Geoffrey began work on a new, cheaper sports car, still with a firm eve on the American market. For his engine, Healey turned to another car which was British-built but plainly intended for American buyers, the Austin Atlantic. The Atlantic saloon and convertible had not been a great success either, but its four cylinder, 2.6-litre engine appealed to Healey. Geoffrey Healey and Barry Bilbie designed the chassis, Gerry Coker styled the bodywork. This was an undoubted work of genius; an elegantly curvaceous shape with a purposefully low stance and a lack of any unnecessary adornment.

The Austin Healey prototype appeared at the 1952 London Motor Show – it had a top speed of over 100 mph. Donald Healey was unhappy about the styling of the grille, so he put the nose up against a pillar at the show but that did not stop the crowds thronging around it. The Healey was the undoubted star of the show and the salesmen on the stand took no less than 3,000 orders. Austin's chief Leonard Lord saw an ideal opportunity for Austin and Healey was engaged as a consultant on a 20-year contract. At the 1953 New York Show, Austin Healey was voted International Show Car of the Year.

The Austin factory at Longbridge began assembling the Austin-Healey 100 in May 1953. Changes over the prototype included slightly raised headlamps and a revised grill (though still the recognisable Healey kite shape). Mechanically, the Healey used the standard Austin Atlantic engine, a huge but torque all-iron four-pot unit which developed 90 bhp. The Healey also took its four-speed gearbox from the Austin, though the bottom gear

was blanked off to turn it into a three-speeder and there was overdrive on the top two since it weighed less than a ton (2015 lb/914 kg), performance was excellent. The top speed was 103 mph and 0-60 mph took a little over ten seconds.

The Healey cost $3,000 (or £730) new, so this was the cheapest 100 mph car on the market. Even better performance was available from 1954, when the 100S was launched. This lightweight competition variant had a 132 bhp light-alloy cylinder head engine. It had mostly aluminium bodywork and was the first production sports car to have four-wheel disc brakes. Each example was highspeed tested by the factory and was easily identified by its shallow perspex wind deflector and oval air intake. Only 55 were made and, unsurprisingly, the 100S is a highly prized collector's car today.

A less expensive way to get better performance arrived in 1955 when the 100M were launched. This was a high-compression 110 bhp version with front anti-roll bar and bonnet straps. By this stage the old Atlantic engine was definitely looking too obsolete. Healey was asked to modify his sports car to meet new demands. He added two inches to the wheelbase, changed the grille to a prettier oval shape and installed a pair of rather marginal rear seats for children. The result was the 100/6, first seen in 1956. It got a cool reception from buyers, who now regarded it as more ‘touring’ than Sports’. Certainly, it was heavier and slower than the old 100, despite an increase in power to 102 bhp.

Leonard Lord chose the 1959 New York Motor Show to launch the new Austin-Healey 3000 line – the Mark II, the Mk IIa and the Mk III. This brought the new 3000 version the nickname ‘Big Healey’. Standard front disc brakes featured on this more powerful (124 bhp) version, although overdrive was optional. The Mark II, from 1961, had triple SU carbs, a new gearbox and a vertically slatted grille, while the Mk IIa got twin carbs, wind-up windows and a curved screen. The final Mk III of 1963 was the most powerful and the fastest of all Healeys, with 148 bhp to play with.

Although the Healey had really developed very little over its life, the car's death in 1968 was probably premature. Officially it occurred because of creeping US safety and emissions laws. The vast majority of the 72,000 cars built over the model’s 14-year lifespan were exported to the United States. Although the Big Healey never had much competition success and was, in its day, viewed more as a good-value tourer than a full-blooded sports car, it is today widely appreciated as one of the great classics. It has a brawny character, an extremely beautiful shape and evokes its period with faultless charm. BMW is seriously rumoured to be reviving the Healey retaining its classic and traditional lines.

3.2. Tools and Measuring equipment for service stations and car workshops

Text 1. CAR MAINTENANCE HAND TOOLS

Sources: https://autoedu.info/en/equipment-and-tools/tools/, https://autoedu.info/en/equipment-and-tools/tools/hand-tools/

Tools are important for successful work during the repair and replacement of parts on the vehicle. Almost every vehicle repair requires the use of tools. Therefore, their procurement, proper use, and maintenance are crucial for car workshops.

While working on the vehicle, the service technician should identify the necessary tools for work, check the correctness of the tool before use, use the tool correctly during operation, perform an inspection upon completion of work, clean and store the tool in the appropriate place.

Tools expand our ability to work on vehicles. Hand tools are most often used during vehicle repairs. Service technicians need a wide selection of hand tools. Over time, vehicle manufacturers are introducing new couplings, fasteners, and new technology, which means that service technicians must constantly expand the range with new hand tools.

Each hand tool has its purpose and procedure of use. Use according to the instructions for use in compliance with safety measures. Otherwise, improper use of tools risks damaging the serviced part of the vehicle and the tools. Also, improper use of tools can hurt yourself and others.

The most common hand tools in car workshops are wrenches, socket wrenches, torque wrenches, torque angle gauges, oli filter wrenches, screwdrivers, pliers, crimping pliers, hammers, chisels and punches, pullers, thread tappers, pop rivet guns, flaring tools and suspension tools.

Text 2. WRENCHES

Source: https://autoedu.info/en/equipment-and-tools/tools/hand-tools/wrenches/

A wrench is a hand tool for tightening and loosening rotating fasteners such as nuts and screws. There are several types of wrenches: open-end, box-end, combination, flare nut wrenches, and tubular.

Higher-quality wrenches are made of chromium-vanadium alloy tool steels. They are often chrome-plated to be corrosion-resistant and easier to clean.

Open-end wrench

Box-end wrench

Combination wrench

Open-end wrenches are used to tighten screws (nuts) with a six-sided head. Because of the open end, this type of wrench can be easily placed on a bolt or nut. The set of wrenches usually contains sizes from 6 to 27 mm, and the ends are arranged in sizes 6-7, 7-8, etc. The wrench opening is usually at an angle of 15° about the handle. This allows a wider range of key movements in a confined space. So, if we can't turn it by the full 60° it takes to put it back on the hex nut, then turn the wrench, tighten it, turn it again, tighten it, and so on until the end.

Open-end wrenches are used because they have good access to the nuts. However, if the nut is too tight, avoid this unscrewing wrench because it grips the screw only at two

points. By applying a stronger unscrewing force, there is a danger that the wrench will slip around the nut and damage it.

The ***box-end wrench*** fits fully around the head of the bolt or nut and grips each of the six points at the corners. These wrenches can be tightened much more reliably on the screw than open-end wrenches. There is little chance of the wrench slipping and damaging the nut when unscrewing.

The position of the wrench in relation to the handle can be in the direction or the knee. The knee wrench is more convenient for screws in inaccessible places. The only drawback is the use when the screw is loosened a bit because it is harder to move and put in a new position.

The ***combination wrench*** has an open-end on one side and a box-end socket on the other. Both ends are the same size. The box-end wrench serves to loosen and the open-end wrench for further unscrewing the screw. Due to its versatility, this key is very popular with service technicians.

Flare nut wrench

Tubular wrench

The ***flare nut wrench*** is used for tightening nuts on the tubing. The average wrench looks like an open-end wrench, only one side is average so that it can be placed over the pipe. This wrench covers the nut better than an open-end because it rests on all six points and not just two. However, since it is open in the end, it is not as strong as the box-end wrench. Do not use this wrench on tight nuts as of may spread and damage the nut head.

Tubular wrenches are used for nuts deep in the holes. The turn of the wrench is done using a transverse lever which is inserted through two holes in the middle of the pipe. Due to the even pressure on all edges of the nut, there is no danger of slipping. Typical representatives of tubular wrenches are the wrench for spark plugs and wheel nuts.

Choosing the right wrench usually depends on two things: how tight the nut is and how much space there is around it to turn.

Hand tool set

When a wrench is used there is always the possibility of it slipping off the screw. Before you use more force, try to predict what will happen if the wrench slips. Whenever possible, it is better to pull the wrench towards you than to push it. If you have to push the wrench, use your palm as you may injure your fingers if it slips. If pulling toward yourself, make sure your face is not close to your hand or in line with your pulling motion. Many technicians have punched themselves in the face when the wrench slipped.

The lengths of the wrenches are usually so long that you cannot destroy the thread on the nut or nut when turning by hand. It is not recommended to extend the key by inserting a pipe or hitting the key with a hammer.

Before starting work, it is essential to think about the task, the work procedure, and the choice of the tool, and review its correctness. Proper use of tools is required during operation while adhering to precautionary measures. After finishing the work, cleaning the device, inspecting it, and putting it in the appropriate place are necessary.

Text 3. SOCKET WRENCHES

Source: https://autoedu.info/en/equipment-and-tools/tools/hand-tools/socket-wrenches/

Socket wrenches are specially designed wrenches. They are very popular with service technicians because of their flexibility and ease of use.

Socket wrench set

Socket

Ratchet

The ***socket*** fits tightly into the nut and encloses it at all six corners. Each socket corresponds to a nut or screw of a certain size. Six- and 12-point sockets fit the heads of hexagonal-shaped fasteners. Four- and 8-point sockets fit the heads of square-shaped fasteners. Sockets have a square recessed that connects the drive of the ratchet or other drivers.

The ***ratchet*** is the drive handle through which the rotation is transmitted to the socket. This handle makes it easy to tighten or loosen the nut with little force. The tensioning mechanism allows the nut to be tightened or loosened with return movements without the need to remove and reset the wrench after each turn. The handle with this mechanism does not require much space for tightening. Tightening/unscrewing is faster compared to classic keys. The ratchet switch can be set to just tighten or loosen the screws. It is not suitable for applying a higher tensile force and can be damaged.

T-handle

Speed brace

Socket Adapters

A ***T-handle*** is used to apply a higher tightening/unscrewing force. Both hands can be used with this tool. The sliding handle is suitable when there are obstacles when turning.

The ***speed brace*** or speeder handle serves to quickly turn the fastener. This handle cannot be used to apply high torque. Used to quickly remove an already unscrewed or run the fastener until it starts to tighten.

The drive handles can be mounted directly on the socket. Various ***socket adapters*** are used when needed. Different adapters lengths are available. Depending on the need, straight or flexible adapters are used.

Based on the size of the fastener, choose the appropriate socket. About the position of the fastener and the environment, choose the handle and the adapters. Mount the selected accessories on the socket by inserting a square socket into the square hole of the socket. When a merge occurs, a click is heard. Select the direction of rotation on the ratchet switch, whether to unscrew or tighten the fastener. Place the socket on the fastener and start moving the ratchet to one side and then to the other without removing it. If greater tightening or unscrewing force is required, replace the ratchet with a T-handle.

Text 4. TORQUE WRENCHES

Source: https://autoedu.info/en/equipment-and-tools/tools/hand-tools/torque-wrench/

A torque wrench is a tool that measures the tightening torque when tightening a fastener. It is used to tighten nuts and screws to a predetermined torque. Tightening is done via a lever that finally has a socket connection similar to a socket wrench. To ensure that the appropriate tightening force reaches the screw, support the head of the torque wrench with one hand. Avoid using extensions as they make it difficult to support the head and transmit torque. Where necessary, use deep nipples instead of extensions. Manufacturers do not specify the tightening force for each nut and screw. For some tightening torque is defined, such as cylinder head bolts.

The torque wrench contains an adjuster and a tightening torque meter. The torque value can be defined in units of Nm (newton-meter), lb-ft (foot-pounds), or in-lb (inch-pounds).

There are several types of torque wrenches: Beam style, Clicker style, Dial, and Digital.

Beam-style torque wrench

Clicker-style torque wrench

The ***beam-style torque wrench*** has two levers. One is a drive lever, and the other is in the shape of an arrow that ends on numerous scales. This system uses a spring steel beam that bends under pressure. When applying the tightening force to the screw, the arrow rotates and shows the value on the scale. A beam-style torque wrench is the simplest but also the most inaccurate. One drawback of this design is that you have to be positioned directly above the scale so you can read it accurately. That can be a problem when working under the hood of a vehicle.

With the ***clicker-style torque wrench***, the required torque value is set first, followed by tightening. The torque wrench clicks when the required tightening torque is reached. This torque wrench is more accurate and the error goes up to 4%. Another advantage is that it is not necessary to monitor the torque value during use. When the set value is reached, it beeps. When the torque wrench clicks, stop turning it because it does not stop tightening. It is easy to miss the click and over-tighten, break, or strip the bolt.

Dial torque wrench

Digital torque wrench

The ***dial torque wrench*** has a precision dial where the tightening force can be read accurately. The disadvantage, as with the beam-style, is that you constantly have to follow the dial during tightening. The advantage is that during tightening the dial remains at the highest measured value, so by moving the wrench we can continue tightening to the required force. Before tightening the next screw, it is necessary to return the meter pointer to zero.

The ***digital torque wrench*** is the most precise and comfortable to work with. The measurement and display of the tightening torque are electronic and are shown on the meter display. Before using the torque wrench, the required value of the tightening force is set. During the tightening, the current torque value is displayed. When the required torque value is reached, an audible signal is heard. Sound advertising is useful in situations where the dial cannot be read.

The torque wrench wears out over time and needs to be periodically checked and calibrated. This is done on a torque wrench calibration device.

Text 5. TORQUE ANGLE GAUGE

Source: https://autoedu.info/en/equipment-and-tools/tools/hand-tools/torque-angle-gauge/

The torque wrench is not a guarantee that the screw will achieve the required tightening force. It is not the same whether tightening a clean screw or a screw that is dirty, rusty, or with a damaged vine. With a clean screw, the tightening force applied with a torque wrench is the same as the tightening force of the coupling surfaces. A higher tightening force should be applied to the dirty and damaged screw to achieve the required clamping force. Therefore, it is necessary to clean all threads before tightening. It is not recommended to lubricate the threads. In most automotive cases, the torque values specified are for dry, non-lubricated threads.

Each screw has its coefficient of elasticity. Heating and cooling, pressure, and vibration cause the screws to stretch and shrink. If they are too tight, they stretch above their endurance point and cannot return to their original position. If they are loose, they do not perform their joining function and malfunction occurs.

To avoid premature failure of the screw due to stretching and shrinkage, the manufacturers have designed a special TTY bolt. The TTY bolt is much more efficient and long-lasting than the classic screw. In the central part of the TTY bolt, there is a stretching zone that functions as a bungee cable, stretches and returns to its original position, and always has sufficient tightening force. Compared to the classic, TTY bolts have a longer

service life, which ensures reliable fixing of the cylinder head to the block during longer operation. However, TTY bolts are disposable and must be replaced after removing the cylinder head.

TTY bolt

Torque angle gauge

The specificity of the TTY bolt is that not only a torque wrench is used to tighten it, but also a torque angle wrench. The screws are first tightened with a torque wrench to the required moderate tightening force. Then it is additionally tightened for a certain angle with the angle wrench until the point of stretching the bolt is reached. Follow the manufacturer's instructions for tightening the bolts, as this is often done in several steps according to a precisely determined tightening order. The specification defines the required angle of rotation of the bolt.

The angle wrench consists of a tightening angle gauge that is placed on the head of the screw. The gauge pointer is set to zero. A wrench lever is mounted on the gauge. Turning the key lever on the meter shows the rotation angle.

Text 6. OIL FILTER WRENCH

Source: https://autoedu.info/en/equipment-and-tools/tools/hand-tools/oil-filter-wrench/

A filter oil wrench is used to remove the oil filter from the engine. These wrenches are available in various designs and sizes, and some are adjustable to fit many filter sizes. Two types are most often used in car workshops. Belt-shaped wrenches fit filters of different sizes and are adjusted by tightening the belt. Socket-shaped wrenches fit a certain type and size of the filter housing, but they require less space to work than a wrench with a belt.

Strap-type and socket-type oil filter wrenches

Oil filter wrenches are only used to remove the filter, never to install it. The new filters are installed manually, which will be additionally tightened during engine warm-up and cooling. A wrench is used to remove the oil filter because more unscrewing force is required.

When using a strap-type wrench, slide the belt over the filter so that the inside of the wrench lever is turned counterclockwise. Adjust the belt opening about the filter housing and pull the lever in the unscrewing direction. If necessary, release the strap and move the

key clockwise to repeat the unscrewing. When the filter is released, remove the key and unscrew the filter completely by hand.

With the socket-type wrench, place the socket on the bottom of the housing, adjust the ratchet handle and place it on the socket. Turn the lever counterclockwise to unscrew the filter. When the housing loosens, remove the insert and unscrew the filter by hand completely.

Text 7. SCREWDRIVERS

Source: https://autoedu.info/en/equipment-and-tools/tools/hand-tools/screwdrivers/

A screwdriver is a hand tool for unscrewing and tightening screws. The screwdriver is selected according to the type of slot or recess on the screw head. The tip of the screwdriver should have the same shape as the slot on the screw head. The tip of the screwdriver should fit exactly into the slot or recess. Otherwise, an improper screwdriver can slip, damage the screw tip and injure you. When using a screwdriver, always consider where the screwdriver blade can go if it slips off the screw head.

Screwdrivers

The tip of the screwdriver can be a flat (slotted), cross (Phillips), Pozidriv, square, hexagonal (hex), Inbus (Allen), and Torx. There are also screwdrivers of special shapes such as offset, ratcheting, and impact. There are also screwdrivers with a magnetic tip for holding screws.

Flat blade screwdriver

Phillips and Pozidriv screwdriver

Square tip screwdriver

The ***flat blade screwdriver*** is the most commonly used screwdriver. It has a flat tip. The shape of the tip should be equal to the slot on the screw head and fit snugly into the slot. Only in this way is the torsional force transmitted evenly from the screwdriver to the side surface of the slot. Otherwise, the tip of the screwdriver will slip out of the slot, which will damage the slot. Flat blade screwdrivers come in a variety of sizes and lengths. Before use, it is necessary to choose the appropriate screwdriver according to the shape of the slot on the screw and the expected unscrewing or tightening force. Be careful when using a screwdriver as it can slip and injure you.

The ***cross screwdriver*** is also called a Phillips screwdriver. Screws with cross-slot screwdrivers are required for Phillips or Pozidriv screwdrivers. The cross-shaped slot holds the tip of the screwdriver firmly on the head and is unlikely to slip out. However, the

screwdriver must be of the appropriate type and size. The Phillips tip corresponds to the conical recess of the slot on the screw head, while the Pozidriv tip is for slots with parallel sides. Phillips screwdrivers are available in sizes 0 (smallest), 1, 2, 3, and 4 (largest). The Pozidriv is similar to the Phillips screwdriver, but its tip is square, flat, and blunt. The Pozidriv tip grips the screw head better and slides less than the Phillips tip.

Square tip screwdrivers are also known as Robertson or Scrulox screwdrivers. They have a square tip. The tip and slot on the screw head are conical in shape which makes it easier to insert and hold the screwdriver on the screw. These screwdrivers are easy to handle and transfer the twisting force well from the screwdriver to the screw.

Hexagon screwdrivers Inbus (Allen)

Torx screwdriver

Offset screwdriver

The ***hexagon screwdrivers Inbus (Allen)*** is a screwdriver with a hexagonal tip (Inbus) or Allen key. It is used to tighten and loosen screws with a cylindrical head and a hexagonal slot.

The ***torx screwdriver*** are for screws with a star slot on the head which are increasingly used in the automotive industry. This shape allows the application of higher turning force and less slipping. Torx screwdrivers are available in four sizes T15 (smallest), T20, T25, and T27 (largest).

The ***offset screwdriver*** fits into spaces where a straight screwdriver cannot and is useful where there is not much room to turn it. This screwdriver has two identical tips that are elbow-mounted and rotated 90 ° to each other. This is because sometimes space allows only a quarter of a turn to be made and screwdrivers are used alternately at both ends.

A ***ratcheting screwdriver*** consists of a ratchet and a set of replaceable, screwdrivers. There is a slider direction menu on the screwdriver. Depending on the slider position, a screwdriver can unscrew or tighten the screw. The set contains sockets of different shapes and sizes. If necessary, insert the appropriate socket on the screwdriver holder easily and quickly.

When the screw gets stuck, rusts, or is too tight, it cannot be unscrewed with standard screwdrivers because they cannot transmit a greater force of rotation. An ***impact screwdriver*** is used to loosen stubborn screws. This screwdriver contains a mechanism that converts the force of the hammer blow into the rotation of the tip of the screwdriver. The impact screwdriver contains interchangeable, plug-in tips of various shapes. The appropriate tip is selected, placed on a screwdriver, the tip is inserted into the slot of the screw head. A sharp blow of the hammer on the top of the screwdriver releases the screw and after that, it can be easily unscrewed with a standard screwdriver.

Ratcheting screwdriver

Impact screwdriver

The power alone is not enough when the screws get stuck or rusty. A strong hand can do more harm than good. When the slot on the screw head is damaged, it will be very difficult and it will take you a long time to unscrew the screw. That is why it is better to use a rust-dissolving agent instead of force. You can then unscrew the screw without any problems.

A screwdriver is not used as a chisel, punch, or lever. Screwdrivers are not designed to withstand shocks or bending pressures. When screwdrivers are used improperly, the tips wear out or break and become unusable, slipping, damaging the head, and being unable to loosen the screw. Then the screwdriver becomes unusable. A faulty tool is a dangerous tool.

Text 8. PLIERS

Source: https://autoedu.info/en/equipment-and-tools/tools/hand-tools/pliers/

Pliers are a type of hand tool designed to hold, cut, bend and clamp. They consist of a pair of metal levers connected at one point. There are handles on the longer end of the lever, and the jaw on the shorter side. Various forms of jaws define the purpose of the pliers. There are combination pliers, cutting pliers, locking pliers, crimping, and many other types of pliers for special purposes.

Choose the right type and size of work pliers. When working with pliers, make sure that your hands are not greasy because they can slip. If the pliers slip, you can injure yourself, and damage the pliers and what you are working on. Pliers are much harder to use when the jaws are worn out and damaged. Always check the condition of the tools regularly.

As with most tools, if you have to invest almost all your strength to achieve something, then use either the wrong tool or the wrong technique.

Combination pliers are most often used in car workshops because they have multiple purposes. The jaw of the pliers contains a flat and serrated holding hole and a wire-cutting blade. The flat part keeps the objects flat, and the jagged ones hold the rounded objects. Cutters are used to cut wires of softer materials and thinner steel wires. utters should be used for softer materials that will not damage the blades.

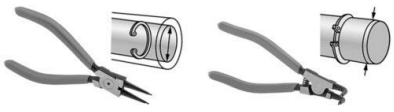
Combination pliers

Needle-nose pliers

Needle nose pliers have long, tapered jaws. They are great for holding small parts or for reaching into tight spots. These pliers have a flat (square) end, unlike the combined ones where it is rounded. The flat end of the jaw allows precise bending of wire or thin steel sheet along the straight edge. There are several forms of needle nose pliers – straight, round and curved.

Arc joint pliers

Diagonal cutting pliers



Snap ring pliers

Most pliers are limited by the size of the grip, and the maximum opening of the jaw. For larger objects, it is necessary to have pliers with a larger jaw opening. For such pur-

poses, ***arc joint pliers*** are used, which have the possibility of separating the handles, which adjusts the desired jaw grip.

Diagonal cutting pliers have a jaw in the shape of diagonal cutters. Used for cutting wires or wedges. They should not be used for cutting hard materials as they will damage the plier's blades. There are cutting pliers with cutters at right angles. They are used for cutting soft materials that protrude about a surface.

Snap ring pliers have metal pins that fit into the holes. There are internal and external fuses. For internal fuses, some pliers press the lever to squeeze the fuse, and for external ones, they open the fuse. Since fuses can easily fall off the pliers and fly away at high speed, it is necessary to wear goggles to protect your eyes from injuries.

Spring steel (Corbin) style hose clamps are commonly used to secure rubber hoses. Gripping and removing these is difficult with standard pliers. ***Hose clamp pliers*** have jaws that are specifically designed to grip these hose clamps making them easier to remove. The built-in ratcheting feature allows the plier to maintain tension on the clamp so hands can be taken off the tool.

Locking pliers or ***fixing pliers*** are pliers for fixing one or more objects. They are useful because they squeeze the object and hold it in place while the hands are free during work. These pliers have an adjustable jaw deflection via screws. To fix an object, place the object between the jaws, turn the screw until the jaws are almost closed, and then squeeze them to close them. You can adjust the clamping force via the screws. To release, squeeze the release lever and the jaws will release the fixed object.

Hose clamp pliers *Locking (Fixing) pliers* *Wire stripping pliers*

Wire stripping pliers or wire strippers are designed to remove the protective coating found on electrical wires without damaging the core wire. Although numerous different wire strippers are available, the process for using wire strippers is generally the same, or at least very similar.

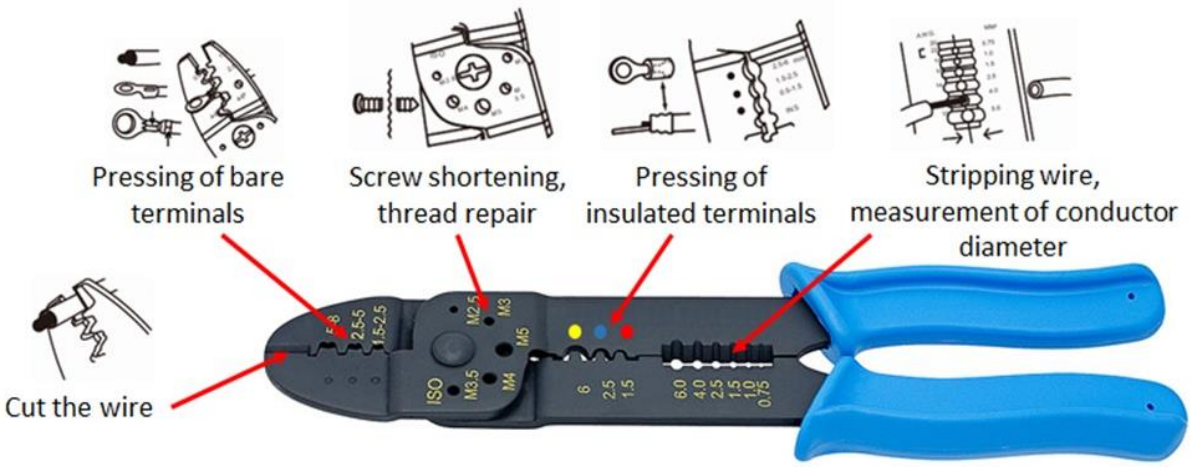
Text 9. CRIMPING PLIERS

Source: https://autoedu.info/en/equipment-and-tools/tools/hand-tools/crimping-pliers/

Crimping pliers are a multi-purpose hand tool. It is designed to do several different things such as cutting cables, stripping wire, crimping insulated terminals, plug connectors, and non-insulated open plug-type connectors, cutting copper and brass screws threaded, repairing vines on small screws, and measuring conductor thickness.

The automotive industry uses electrical connections to solder-free connectors. The use of crimping pliers is convenient for quick and efficient removal and re-establishment of the electrical connection. Solderless connections require a clean, solid connection without transient resistance.

Terminals of different shapes and sizes are used for the connectors. According to the shape, they can be quick-disconnect terminal, spade terminal, hook terminal, ring terminal, snap plug terminal, butt splice, etc. There are non-insulated and insulated terminals. Insulated terminals are usually in three colors that define the size of the conductor: red (0.5-1.5), blue (1.5-2.5) and yellow (2.5-6).



Crimping pliers

Insulated terminals

Only remove as much insulation as it is necessary to fully enter the terminal. In the case of a stranded conductor, twist them slightly after crimping. Use a proper crimping tool for the terminal you are crimping. Do not use pliers, as they tend to cut through the connection. Select the proper anvil. Use firm pressure so that a good electrical contact will be made, but do not use excessive force, as this can bend the pin or terminal.

Text 10. HAMMERS

Source: https://autoedu.info/en/equipment-and-tools/tools/hand-tools/hammers/

A hammer is a hand tool that serves to move or deform an object with strong blows. Depending on the purpose, there are hammers of different shapes and materials. There are hammers with a hard steelhead and soft hammers made of rubber, plastic, brass, or copper.

Hardhead hammers are made from high-grade alloy steel and hardness. The head of these hammers must be harder than the material used.

Machinist's hammer

Ball peen hammer

Sledgehammer

A ***Machinist's (locksmith's) hammer*** is for general purpose, with a flat head on one side and a right-angle blade on the other. Used to force objects together or apart. The sharp part is used for inaccessible places when the flat part cannot be approached. The hammer

should always match the size of the job, and it is usually better to use one that is too big than too small.

The ***ball peen hammer*** or the ball-shaped hammer has a head with a flat tip and a ball. It is usually used to remove or install rivets.

The ***sledgehammer*** is the heaviest type of hammer that can be used one-handed. It is used for breaking out when it is necessary to apply a strong blow. It is usually used in tandem with a punch or blade for cutting screws, removing pin joints, etc.

Soft-faced hammer

Dead blow hammer

Soft-faced or soft-headed hammers are used to place, move or remove soft parts. A hammer with a rubber head is most often used, for example, to hit a crankshaft when measuring lateral displacement or to remove a seal on an aluminum housing. A hammer with a brass head is used to hit the gear or shaft because it will not damage them.

A ***dead blow hammer*** is designed so that it does not bounce when something hits. A rebounding hammer can be dangerous and harmful. The head of the hammer can be made of lead or more often hollow polyurethane filled with lead shot or sand. The head absorbs the blow when the hammer makes contact, reducing any bounce-back or rebounding. This hammer can be used when working on the vehicle chassis or when dislodging stuck parts.

Text 11. CHISELS AND PUNCHES

Source: https://autoedu.info/en/equipment-and-tools/tools/hand-tools/chisels-and-punches/

Cold flat chisels are most often used to remove rusty nuts or bolts whose heads are rounded or damaged. For this purpose, we choose a cutter with a flat blade made of high-quality steel. The cutting angle is about 70°. The tip of the chisel is hardened and is stronger than the metals it is cutting. The head of the chisel needs to be softer so it will not chip when it is hit with a hammer.

The ***cross-cut chisel*** has a blade at the top along the width of the blade. It is used for cleaning canals or making new ones.

Because the chisel heads are softer than hammers, over time, the top of the head deforms and there is a possibility of separating small fragments that can injure us. Occasionally, damaged parts of the chisel tip should be removed with a grinder.

Prick and center punches are used for precise marking on sheet metal or plates.

The ***prick punch*** has a thin and very sharp tip so that a light blow of the hammer leaves a clear indentation. They can also be used to scribe intersecting lines between given points.

A ***center punch*** is used to mark the center. It makes a bigger indentation that centers a drill bit at the point where a hole is required to be drilled. This marker has a wider tip and can be applied over a dotted recess. The top angle is between 60° and 90°.

Cold flat and cross-cut chisels

Prick and center punches

Drift and pin punches

Drift and pin punches are used where the hammer head cannot reach without damaging the surrounding parts. The hammer blow is precisely transmitted from the soft upper part of the hammer to the hard tip made of hardened steel.

The ***drift punch*** is used to align the screw holes between two surfaces, such as the valve cover and the cylinder head. The top of the conical end is placed in semi-aligned holes and by slightly inserting the cone we align the holes. After aligning the opening, it is easier to insert a screw to connect the two surfaces.

Pin punches are used to drive out pins or rivets. They are available in various diameters and have a long slender shaft.

Text 12. PULLERS

Source: https://autoedu.info/en/equipment-and-tools/tools/hand-tools/pullers/

The removal of gears and bearings is done carefully, precisely with the use of higher power. Often there is a small gap between the two elements. The inner diameter of the hole is often 0.025 mm larger than the outer diameter of the shaft. Using a hammer or hammer can damage the removable part and the shaft.

Pullers with suitable jaws and adapters are used to remove gears, pulleys, bushings, and bearings.

Two- and three-legged pullers

Pullers can be of different shapes and sizes. They consist of three parts: the jaws, a cross-arm, and a forcing screw. The jaw can have two or three arms symmetrically placed. The cross-arm connects the jaw and the central, forcing screw. Jaws include the part to be removed. The forcing screw is located in the middle of the cross-arm. The screw is long with a fine-threaded bolt that rests on the middle part of the shaft. By turning the screw, the shaft is pushed with great force, and the shorter jaws easily and precisely pull out the part. The arms are elbow-shaped and extend outwards during extraction, providing linear removal.

Before pulling out, make sure that the arms are correctly positioned. If they cannot be installed, choose a more suitable puller. Do not use an improper puller as you may damage the removable part and the shaft surface.

Text 13. THREAD TAPPERS

Source: https://autoedu.info/en/equipment-and-tools/tools/hand-tools/thread-tapping/

Thread tappers are used for thread tapping/cutting which involves thread turns being cut-shaped on bolts or in bores with multiple-edged tools.

Threads can be produced as: internal threads (female threads) with screwtaps and external threads (male threads), e.g. with cutting dies.

The tap cuts female threads in a component so a fastener can be screwed into it. The inner thread is cut from the inside of the material hole. The tap is selected according to the size and height of the thread. Before thread taping, it is necessary to determine the diameter of the hole and perform drilling. The diameter of the hole is determined based on the size of the screw we want to use. The size of the screw is denoted by the mark M. If we have a screw M8 multiply it by a factor of 0.8 and get the diameter of the hole in millimeters. M8 x 0,8 = 6,4 mm

Drilling is performed with a drill bit of approximate diameter, in our case 6.5 mm. There is a drill bit diameter table for the corresponding screw thread diameter:

Screw thread size	Drill bits diameter
M4	Ø 3,3mm
M5	Ø 4,2mm
M6	Ø 5,0mm
M8	Ø 6,5mm
M10	Ø 8,5mm
M12	Ø 10mm
M14	Ø 12mm

Tappers

Tap handle

Hole drilling is done at right angles. Three screw-taps are used for threading: Taper tap (with one line), Intermediate tap (with two lines) and Bottoming tap (without line). First, a ***taper*** tap is used which is placed in the ***tap handle***.

Make sure that the tap is at a right angle to the material and the hole. The incision is made by turning the tap handle to the right (clockwise). During the taping, it is necessary to periodically turn the notch slightly to the left so tap the incised material is removed so that the notch itself is not damaged. The harder the notch material, the more often you need to return the tap. As soon as resistance is felt during the incision, we return the notch for a tap of the circle. Cutting oil is used for easier cutting. When we cut a taper tap, we use an intermediate tap, and then a bottoming tap. Bypassing all three tapes through the hole, a thread was formed for the desired screw. We test the correctness of the thread tapping by inserting a screw.

To perform the process of tapper thread cutting, follow these steps.

1. Drilling: Select the appropriate drill bits diameter based on the screw. Use the comparison table to select the drill bit. Drill a hole in the marked place at right angles.

2. Thread tapping: The thread tapping is made with tapes in a row taper tap, intermediate tap and bottoming tap. Use cutting oil for easier cutting. Turn the tap handle to the right, lightly, carefully and at right angles. As soon as the resistance is felt, turn the tap handle slightly to the left and continue further.

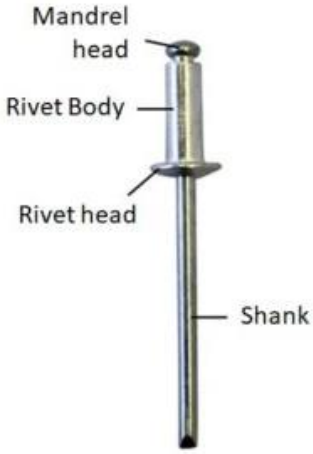
3. Check: After thread tapping, insert the appropriate screw. The screw should be screwed in completely without resistance and without slipping.

Text 14. POP RIVET GUNS

Source: https://autoedu.info/en/equipment-and-tools/tools/hand-tools/pop-rivet-guns/

Pop rivet guns are convenient for quick riveting of light materials. The rivet has a body that forms the finished rivet and a mandrel that is discarded when the riveting is completed. It is often called blind riveting because there is no need to see the other side of the riveting hole it reaches. Some types of rivets are sealed so that they are waterproof or pressure-proof.

Pop rivet gun



Rivet

The ***rivet*** is inserted into the plier's holder, and the rivet body is inserted into the material hole. When the pliers are squeezed, the mechanism retracts the mandrel, tightening the rivet body. The head of the mandrel acts on one side of the rivet body, and on the other side, the pliers push the rivet head, causing it to be swell. By swells, a rivet is formed that tightens and joins the two parts of the material. When the riveting and joining are complete, the rivet mandrel falls off.

The rivet is a disposable fastener, unlike a nut and bolt that can be disassembled and reused. When riveting needs to be removed, it must be drilled out or cut off.

To perform a riveting operation, you need a rivet gun, rivets (pop rivets), a drill, a drill bit of appropriate size, and material to be riveted (e.g., sheet metal).

When choosing rivets for work, take into account the diameter, length, and material. The length of the rivet body depends on the thickness of the rivet materials, i.e., on the depth of the hole. Usually, the length of the body should be 1.6 times longer than the thickness of the material. The rivet material is always chosen according to the riveting material. Stainless steel rivets are used for riveting stainless steel materials, and aluminum rivets are used for riveting aluminum parts. The drilled hole must be wide enough so that the rivet can easily pass through it. If the hole is too wide, the rivet will be too loose and will not hold the joined materials firmly. The rivet tools can work with different sizes of rivets, selection, and installation of the appropriate bracket.

Text 15. FLARING TOOLS

Source: https://autoedu.info/en/equipment-and-tools/tools/hand-tools/flaring-tools/

The flaring tool is used to flare the end of a tube for better sealing when connecting to another tube or component. The tool widens the end of a tube to form a suitable shape.

There are three different flange shapes: a ***single flare*** is for lower pressures such as fuel; a ***double flare*** is for higher pressures such as brake system, and an ***ISO flare*** which is

the metric version used in brake systems.

Single flare, double flare and ISO flare

Tube flaring tool set

Tubing cutter

The flaring tool has two parts, a block with holes corresponding to the diameter of the tube being shaped and a yoke that redirects and pushes a cone into the mouth of the tube.

A special ***tubing cutter*** is used to prepare and cut the tube. As the cutter rotates around the tube the blade point cuts the tube around the circumference. The screw increases the pressure, driving the wheel deeper and deeper through the pipe until it finally cuts through. After cutting with a file, smooth the upper surface and lightly fold the outer edge of the tube.

To make a single flange, the end of the tube is placed in the appropriate hole of the block. The end is aligned with the upper surface of the block and tightened the tube firmly in the block. Direct and press the conical insert over the yoke into the opening of the pipe, whereby the conical insert flares the end of the tube.

Making a double flare requires another step. The tube is placed in the hole and the end of the tube is raised above the bracket as much as defined by the tool measure. First, a bubble-shaped end is formed with the appropriate insert, and then a double flare is formed with a conical insert.

To obtain the ISO flare, only the first part of the previous procedure is used to give the end of the tube the shape of a bubble.

Text 16. SUSPENSION TOOLS

Source: https://autoedu.info/en/equipment-and-tools/tools/hand-tools/suspension-tools/

There are general and specially designed tools for working on the suspension system. Some are used to test the condition, and some to repair the suspension elements.

Pry bar

Ball joint separator pickle fork

Pitman arm puller

Tie-Rod End and Ball Joint Puller

The following tools and equipment are used to service the suspension system. A ***pry bar*** is used to pry parts to check for play. A ***pitman arm puller*** is used to pull the pitman arm from the sector shaft. A ***tie-rod end and ball joint puller*** is used to remove tie-rod

ends and pull ball joint studs from the steering knuckle. A ***ball joint separator pickle fork*** is used to remove ball joints, tie rods, pitman arm, and other linkages. During removal, ruins the grease seal and is not the most suitable tool for removing components if they need to be used again.

Tie-rod sleeve-adjustment tool

Spring/strut compressor tool

Dial indicator

A ***tie-rod sleeve-adjusting tool*** is required to rotate the tie-rod sleeves and perform some front wheel adjustments. A ***spring/strut compressor tool*** is used to compress coil springs during removal and installation. ***Dial indicators*** are used to measure play in ball joints.

Text 17. AIR TOOLS. AIR COMPRESSOR

Sources: https://autoedu.info/en/equipment-and-tools/tools/air-tools/,https://autoedu.info/en/equipment-and-tools/tools/air-tools/air-compressor/

Air tools use compressed air for their operation. Compressors in car workshops create pressures higher than 6 bar and therefore care should be taken. The compressed air system comprises a compressor, a pressure regulator, an air hose or fixed piping, and air tools.

The whole system uses quick-connect fittings so that various air tools can be used on the same air hose. There are several types of quick-connect fittings, and the workshop usually uses one type throughout the entire workshop.

Compressed air tools are pumps, air nozzles, impact wrenches, drills, grinders, cutters, grease guns, jacks, etc.

Compressed air is driven by various air tools. The source of compressed air is an ***air compressor***. A compressor is a device that compresses air and stores it in a tank. The main drive of the compressor is an electric motor, and a portable one can have a petrol engine. It is very noisy during work and is often placed in a special room to isolate noise.

Air compressor

Scroll compressor type

Standard compressors are piston-type engines that compress air in the stroke of compression. Compressed air is conducted to the storage tank. Many newer air compressors are of the ***scroll compressor type***, which uses a pair of rotating scrolls to compress the air. Scroll compressors are much quieter and more efficient.

The air pressure supplied to the distribution system is controlled via a pressure regulator. In many countries, the law regulates the maximum air pressure in the system to avoid possible accidents due to excessive pressure. Compressed air is transferred to pneumatic tools via pipes and hoses.

Always treat compressed air carefully. When using air tools, use appropriate protective equipment. Do not inappropriately use compressed air, as if to blow the dust off yourself. Serious, sometimes fatal injuries can be caused by compressed air. Internal organs and blood vessels can rupture even at much lower air pressures than those in the system. Be very careful when working with air tools. Be especially careful when you are in a confined space, under a vehicle, or during cleaning, as air pressure can blow dirt or liquid back with high force. The appearance of bloating and balloons on the intestines is a sign that they are damaged and should be replaced immediately because they can burst and injure you.

Text 18. AIR SYSTEM DRYING AND LUBRICATION

Source: https://autoedu.info/en/equipment-and-tools/tools/air-tools/air-system-drying-and-lubrication/

The ***compressed air drier*** is mounted on a compressed air supply system to remove moisture. The compressed air from the atmosphere contains water in the form of humidity. If water gets into the compressed air lines, it can damage the inside of the air tools. The air drier is installed as a stand-alone device or as part of a filter-regulator system. The combined filter-regulator device removes moisture from the air, filters any impurities coming from the compressor tank, and regulates the system pressure from the tank.

The simplest device is a water trap that collects water droplets while the air is cooling. With such a drier, it is necessary to occasionally drain the collected water by hand. Some advanced devices are equipped with an automatic drainage device.

Compressed air drier

Chiller-type air drier

Automatic oilers

Another type of air drier is the ***chiller-type air drier*** that uses the principle of air conditioning to cool compressed air, which performs forced condensation of water vapor and rapid drying of the air. This system is more expensive but also more efficient in the process of air drying. It is used by painters where moisture must be removed from the compressed air so that it does not mix with the paint in the process of spraying on the surface of the vehicle.

Air tools require regular lubrication to reduce wear. This is usually done daily by adding a few drops of air tool oil to the air supply line. The oil lubricates the internal parts of the tool.

There is a device that automatically lubricates air tools so it does not need to be manually lubricated before and during operation. ***Automatic oilers*** are placed on air hoses near the tool, where they constantly inject a small amount of oil into the flow of compressed air, which is transferred to the tool together with the air. It is necessary to periodically check the oil level and the correct dosage of the automatic lubricator.

A central device containing a filter, drier, pressure regulator, manometer, and lubricator is often installed in the air system. This combined device is simpler to operate and control the condition of the air system in one car workshop.

Text 19. AIR NOZZLE AND TIRE INFLATOR GUN

Sources: https://autoedu.info/en/equipment-and-tools/tools/air-tools/air-nozzle/, https://autoedu.info/en/equipment-and-tools/tools/air-tools/tire-inflator-gun/

The ***air nozzle*** (blower) is the simplest air tool that flows compressed air through the nozzle to the area to be cleaned. Activation is done via a simple manual valve. There are several types and shapes of nozzles that are chosen depending on the needs and places of application.

Air nozzle

Tire inflator gun

The air nozzle simply and easily connects to the air hose with compressed air via a quick-connect fitting. Air nozzles are used for cleaning and blowing parts from dirt, sawdust and liquids.

When using the air nozzle, be sure to apply protection and safety measures. When blowing sand, sawdust, liquid due to the strong action of the air jet, parts of the dirt can return and injure you. Therefore, it is mandatory to use eye protection when blowing. Also, close your mouth while using the blower to prevent blown dirt from entering your mouth. Noise levels are usually high, so ear protection should also be worn. The jet of air is carefully redirected away from the operator and away from other people nearby. It is dangerous to use an air nozzle to clean yourself off because pressurized air can damage the skin and soft internal organs.

A ***tire inflator gun*** is an indispensable air tool in every car workshop. If the workshop has a compressor then you should have this very cheap and practical tool. Pneumatic line connection can be done with or without quick-connect fitting. When it is for free use, it is better to have it without a quick-connect fitting to prevent the theft of this tool.

Some versions have a mechanism that allows the top of the hose to be attached to the tire valve. You should drink with caution when using this mechanism, because due to the carelessness of the operator, the tire may inflate and burst. The tire inflation gun must also contain a pressure gauge (manometer) that measures the pressure in the tires. During inflating without a manometer, we cannot determine the tire pressure prescribed by the vehicle manufacturer. On the manometer, there are usually two scales for measuring pressure, expressed in units of bar and psi.

Text 20. AIR IMPACT WRENCH

Source: https://autoedu.info/en/equipment-and-tools/tools/air-tools/air-impact-wrench/

The ***air impact wrench*** is one of the most popular tools for service technicians. It is sometimes called an impact gun or rattle gun. It is available in different sizes with different impact sockets. It is intended for loosening large, very narrow screws.

Specially hardened impact sockets are used for impact wrenches because ordinary ones can crack or explode and thus endanger the safety of the operator and others in the immediate vicinity.

Air impact wrench with sockets

Air impact wrench elements

Air impact wrenches are useful for loosening lug nuts on a raised vehicle without locking the wheels due to turning. They are used to separate the exhaust manifold because it releases nuts and bolts with a blow instead of tearing them off. They are also convenient on the shock absorber bolts, as well as the flywheel because it is not necessary to block the crankshaft rotation.

The air impact wrench can be turned in both directions. The selector is used to select whether to unscrew or tighten the bolts and nuts. High-power models can deliver a torque of up to 600 Nm. The output shaft rotates at 2,000 to 14,000 rpm depending on the model. When the air impact wrench encounters resistance, a small spring-loaded hammer strikes the drive shaft on which the socket is located. Every hammer blow moves the socket a little until the equilibrium torque is reached, i.e., when the torque of the screw is equal to the output torque of the impact wrench. To increase the unwinding force, it is necessary to bring more air by turning the air flow control knob counterclockwise.

When an especially tightened screw is encountered, a little oil can be put into the inlet port of the air impact wrench to better seal the blades in the tool. Some compressed air supply systems have an additional device for automatic lubrication of air tools.

An impact wrench is never used for the final tightening of lug nuts. There is a risk of overtightening which can lead to failure and cracking of the nut and bolt.

Text 21. AIR RATCHET AND AIR DRILL

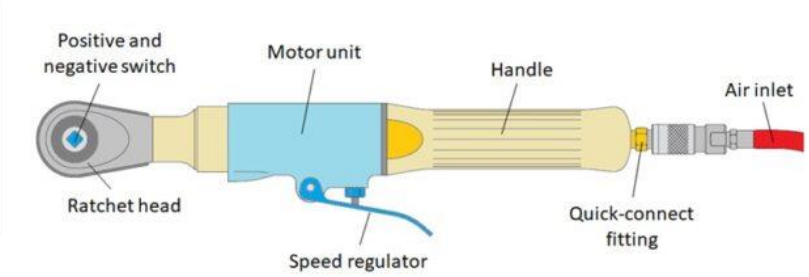
Sources: https://autoedu.info/en/equipment-and-tools/tools/air-tools/air-ratchet/, https://autoedu.info/en/equipment-and-tools/tools/air-tools/air-drill/

The ***air ratchet*** looks like a hand ratchet only it has a thicker handle that contains an air drive. It uses compressed air to quickly tighten and loosen smaller nuts and bolts.

Due to their rotary drive, they are convenient for use in hard-to-reach places, where other hand wrenches and tools cannot function. Drive and rotation speed are done manual-

ly using the controller. Compressed air is supplied via a quick-connect fitting on the back of the ratchet. Compressed air moves the blades of the drive, creating a rotation that is transmitted to the head of the ratchet. The direction of rotation of the nozzle is selected via a switch, which ensures that the screws are tightened and loosened.

Air ratchet

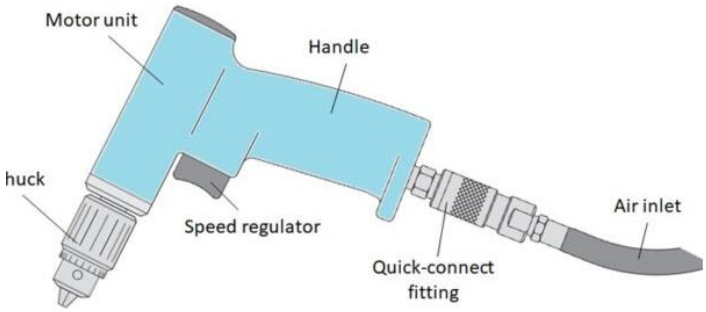


Air ratchet elements

Air ratchets do not have high torque and impact hammers, so they only serve to unscrew quickly when the bolt/nut loosens. After tightening the bolt/nut with an air ratchet, a final tightening must be performed.

The ***air drill*** is very compact and works at high speeds. They have the same mode of operation as electric drills but are smaller and lighter. Compactness makes them more suitable for work in car workshops.

Air drill



Air drill elements

The main drive of an air drill is compressed air that is supplied via a quick-connect fitting. The pressurized air rotates the blades of the air motor and transfers this rotation to the chuck of the drill. The speed of rotation depends on the amount of compressed air that is dosed via the speed regulator. Drill bits, grinding parts and brushes for polishing and cleaning can be placed on the chuck.

An air drill has some important advantages over the more common electric power drill. With the appropriate attachment, a hole can be drilled, grind, polished and cleaned. Unlike an electric drill, this one does not pose a risk of creating a spark, which is important for working around flammable liquids or gasoline tanks. Also, it does not heat up with prolonged use.

Text 22. AIR HAMMER AND AIR GREASE GUN

Sources: https://autoedu.info/en/equipment-and-tools/tools/air-tools/air-hammer/, https://autoedu.info/en/equipment-and-tools/tools/air-tools/air-grease-gun/

An ***air hammer*** also called an air chisel, is a useful tool for cutting and punching. Due to the additional force created by compressed air, it is more efficient than the use of a hand chisel and hammer.

There are various types of cutter and punch inserts that are mounted on the receiving head of the air hammer.

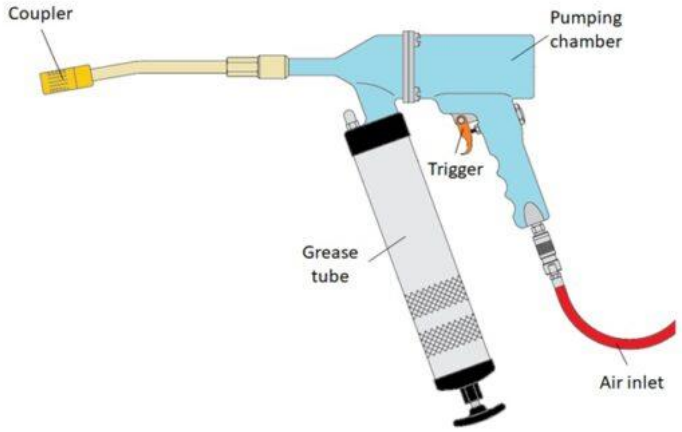
The air hammer is most often used for cutting a bolt, as well as for driving out a broken lug stud. The insert in the hammerhead holds a spring that is damaged over time and never uses it if it is broken.

Place the top of the insert and hold it firmly against the workpiece before pressing the hammer activation button, otherwise, it will bounce around.

The air hammer creates noise that exceeds the maximum allowed level, and due to hearing protection, the use of ear protection is mandatory.

Air hammer

Air grease gun



Air grease gun elements

The hand ***air grease gun*** is convenient for occasional grease of parts. However, when there are a large number of grease points then an air grease gun has a great advantage.

These devices do not differ much from a hand grease gun, except that compressed air provides thrust. A standard grease cartridge is installed in the housing. Each time the trigger is pressed, the cylinder expands and cyclically pushes the grease out of the cartridge. When the trigger is released, the cylinder and pump are reset.

Care should be taken when using an air grease gun. If the gun is activated when the tip is not on the grease part, part of the grease is fired in the workshop.

Text 23. ELECTRIC TOOLS. DRILL

Sources: https://autoedu.info/en/equipment-and-tools/tools/electric-tools/, https://autoedu.info/en/drill/

Electric power tools use electricity. High-quality ***electric tools*** allow you to do your job quickly and efficiently.

There are electric tools that are powered by a classic power outlet and those that are powered by batteries. In car workshops, cordless tools are increasingly being used, which provide the possibility of working away from an electrical outlet or working in a confined space. Cordless electric tools are equipped with powerful, long-lasting batteries with quick charging ability.

Be careful when working with mains-powered power tools. Observe electric shock precautions. Due to the risk of sparks, electric tools are not used in the area of flammable liquids or petrol tanks. During use, be careful not to heat power tools, as overloading can

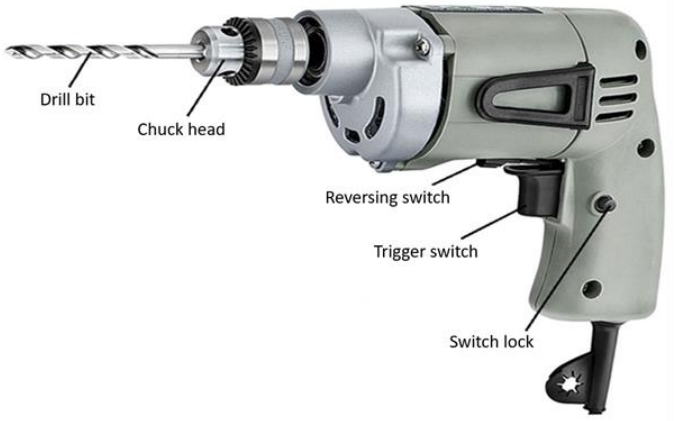
lead to destruction. Before and after use, check the condition of tools and electrical cables for damage.

The electric tools are a drill, an angle grinder, an electric screwdriver, and a soldering iron.

The ***drill*** creates cylindrical holes in the material by rotating the drill bit. There are two types of electric drills, ***corded drills*** powered by an electrical source and ***cordless drills*** powered by batteries. Corded drills are a good choice when moderate power is needed or if extended drilling is required. If you need to work away from an electrical outlet, or if your project means you're working in confined spaces, cordless drills are convenient for such work.

Corded and cordless drill

Drill bit



Drill elements

The drill consists of an electric motor, a handle and a chuck. The power of the drill depends on the power of the electric motor and is expressed in W. There is a start switch on the handle, which is also a speed regulator (trigger). There is also a forward/reverse switch on the handle. The chuck is used to mount the drill bit. It defines the largest diameter of the drill bit that can be mounted and used for drilling. There are also special hammer drills that have provided hammer-like action that drills through thick, solid surfaces. such as concrete, wall, stone and brick.

A drill bit is a cutting tool to create holes. The upper part of the drill bit is of a smooth cylindrical shape which is used for fastening on the chuck. The cutting part of the drill bit is in the shape of a spiral, and the top is adapted for cutting material. The drill turns the drill bit, which gradually, axially enters the hole. The spiral serves for chip removal. Drill bits vary in size (diameter) and construction. Depending on the material being drilled, there are different drill bits and they differ according to the construction of the top. This is how we distinguish drill bits for metal, wood and concrete.

Text 24. ANGLE GRINDER AND ELECTRIC SCREWDRIVER

Sources: https://autoedu.info/en/equipment-and-tools/tools/electric-tools/angle-grinder/, https://autoedu.info/en/equipment-and-tools/tools/electric-tools/electric-screwdriver/

An ***angle grinder*** is a versatile power tool designed for grinding, cutting, sanding, and polishing.

Lamellar flap ***grinding discs*** are used for grinding. They are used for sanding excess material or sharp edges. Special abrasive ***cutting discs*** are used for cutting metal. Smooth and precise cuts in a metal can be made with a sander. They can often cut material in place. Abrasive fiber ***sanding discs*** are used for sanding. Sanders are ideal for polishing

surfaces thanks to their high speed. Appropriate ***polishing*** plates, ***discs*** and sponges are used for polishing.

The angle grinder can throw sparks, so direct the sparks in a safe direction or install a protection guard. Use eye and ear protection when grinding, as it is very noisy and can damage your hearing.

Angle grinder

Grinding, cutting, sanding and polishing discs

Electric screwdriver

The ***electric screwdriver*** is useful where many screws need to be removed. Cordless screwdrivers are more suitable for use because they are easily portable and affordable compared to corded screwdrivers.

The electric screwdriver is intended for unscrewing and tightening screws without excessive tightening. Cordless screwdrivers are made for greater comfort and easier portability. They rely on batteries as a power source and are not restricted by access to electrical outlets. They are easy to use in narrow and cramped places. Along with a set of replaceable screwdrivers for all types of screws and accessories, it is an unavoidable part of tools in car workshops.

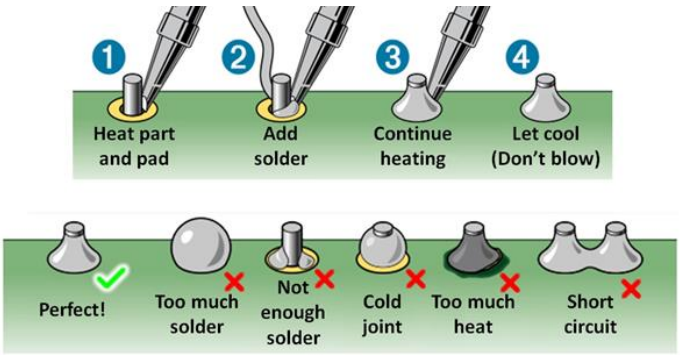
Text 25. SOLDERING IRON

Source: https://autoedu.info/en/equipment-and-tools/tools/electric-tools/soldering-iron/

The ***soldering iron*** is used for melting easily soluble metal to connect metal parts, most often conductors. There is a ***soldering gun*** and soldering iron. Heat in a soldering iron is usually produced from electricity or butane-powered. Electric soldering irons are mostly used. The electric heater in the soldering iron heats the tip to the required temperature for melting the ***solder wire***.

Soldering iron and soldering gun

Solder wire and soldering flux



Soldering procedure and solder quality

Solder wire is a mixture of metals with low melting points and is used to join metals together. Tin-lead solder is used for soldering. Tin-lead solder for automotive applications consists of 60% tin and 40% lead and melts at approximately 190°C. With the environmental hazards of lead becoming an issue, it was introduced lead-free. Lead-free solder is made up of tin and copper, or of tin, copper, and silver. These alloys have a slightly higher melting point.

Solder creates good electrical contact between two conductors or joints in an electrical circuit. Before soldering, the electrical connection must be cleaned. It used an external ***flux*** cleaning agent of rosin. Flux help make the solder flow. The solder can also be hollow, with the rosin or acid in the core. In this case, it would be referred to as rosin-core solder or acid-core solder.

The process of soldering involves heating the metals (wires) hot enough so that the solder melts and fills the spaces between the metals. Soldering heat is provided by a soldering iron. The soldering iron has a handle that is thermally insulated. The tip of the soldering iron is heated, and the thermostat in the soldering iron controls the temperature. The soldering temperature is critical.

As to ***solder quality***, if it is not hot enough, the solder does not flow very well and does not make good contact with the metal surfaces, and tends to glob up. It is a cold solder. This makes for a weak joint and poor electrical conductivity.

If it is too hot, the solder tends to run off the joint and overheat the components being soldered. In the case of electronic components, overheating can make them inoperative. Only heat the components enough to melt the solder and cause it to flow, which can cause a short circuit to other electrical connections.

As to ***soldering procedure***, tin the soldering iron tip by melting some solder to it and wiping any excess from the tip with a rag. Apply flux to the joint if cored solder is not being used. Always remove any excess flux when finished. This may not be necessary if you are using cored solder. The tip of the soldering iron rests on the soldering spot. Apply the solder to the joint near the top. When the metal joint is well heated, the solder spills over the entire joint. When the solder spills, the soldering iron and solder are removed. Ensure the joint does not move until the solder has cooled sufficiently to set. Once cooled, inspect the joint; it should be shiny and firm. Clean any excess flux from the joint.

Text 26. MEASURING EQUIPMENT

Source: https://autoedu.info/en/equipment-and-tools/measuring-equipment/

Some interventions on the vehicle, such as engine repair, require the use of measuring devices. ***Measuring equipment*** is used to measure various physical quantities: length, thickness, weight, thrust force, pressure, temperature, angular displacement, flow, voltage, current, frequency, etc.

Measuring devices are precise and sensitive instruments. They should be treated with great care. You should never strike, throw or overload the measuring equipment as they may be damaged. The more precise they are, the more sensitive they are too rough handling. Clean them after each use. Check and calibrate the measuring devices regularly. Before performing the measurement, find out about the expected exact values and permissible deviations. Even the slightest measurement error can be crucial to the correct operation of the engine and other systems on the vehicle.

Two systems of measures are used in the world, metric and imperial. Often measuring devices have a measuring scale of both systems. However, when we have the required values in one and the measuring device in the other system, then there is a problem when

reading and comparing the measured value with the required one. The International System of Units has adopted a metric system where each unit is multiplied or divided by 10 to obtain larger or smaller units. This makes the metric system much easier to use, with less chance of error compared to the imperial system.

The basic unit of linear measurement in the metric system is the meter. The basic unit of linear measurement in the imperial system is the inch. The automotive industry has largely accepted the metric system of measures, but technicians must know how to measure and work with both measuring systems. The technician is expected to perform various measurements during operation. So, you need to know what tools are available and how they are used. Measuring tools are a measuring tape, a ruler, a machinist's rule, a feeler gauge, a vernier caliper, a micrometer, a dial indicator, a test light, a circuit tester probe, a multimeter, a current clamp, a diagnostic tool and an automotive oscilloscope.

Text 27. MEASURING TAPES AND RULER

Source: https://autoedu.info/en/equipment-and-tools/measuring-equipment/measuring-tapes-and-ruler/

The simplest measuring tool, a ***ruler***, is used to measure the length. Depending on the needs and the place of application, they can be strip, metal, wooden, soft, or laser. In-car workshops, measuring tape and machinist's rules are used.

Measuring tapes are a flexible type of ruler in the form of sheet metal that is wound into a housing with a spring return mechanism. Can be of different lengths, usually 2, 3, 5, 8, and 10 m. The measuring tape is pulled from the housing to measure items, and a spring return winds it back into the housing. There is a locking mechanism on the housing that holds the extended measuring tape to the desired length.

Measuring tape

Machinist's rule

Lengths with large, medium and small lines are marked on the measuring tape. There is a distance of 1 cm between every two lines. A small and a middle line are placed between the two large lines. The middle line represents 5 mm. Each small line determines the length in mm, which is the smallest measure of the measuring tape.

The ***machinist's rule*** looks like a ruler and is made of metal (steel, aluminum). The measuring scale is located on the edge of the rule and is divided into divisions. The minimum dimension is 1 mm. They are used to measure and mark out items. Protect the machinist's rule from damage by storing it carefully. A damaged ruler will not give an accurate measurement because it determines the beginning of the measure. If damaged, it may affect the accuracy of the measurements.

Text 28. FEELER GAUGES

Source: https://autoedu.info/en/equipment-and-tools/measuring-equipment/feeler-gauges/

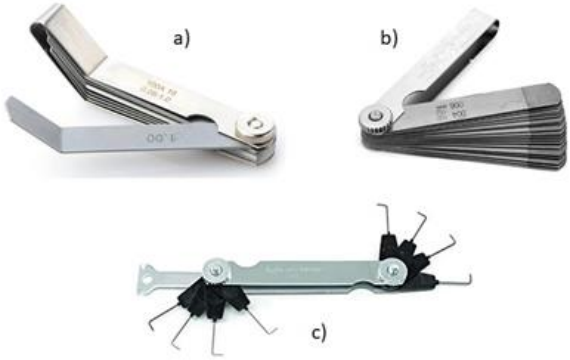
Feeler gauges are measuring instruments for measuring the gaps, the interspace between two surfaces. These are flat metal strips of varying thicknesses. The thickness is

marked on each sheet. They are delivered in sets of different sizes in millimeters or inches, usually in the range from 0.05 to 1 mm. Some kits contain measuring strips made of brass that are used to measure magnetic components. Brass is a non-magnetic material and the gap can be measured without any problems.

Feeler gauges are used to determine the clearances on bearings, pistons, valves, etc.

Some feeler gauges are ***bent*** (a) to make it easier to insert where space is tight. The others are ***stepped*** (b), i.e., the end of the leaf is of nominal thickness and the number is higher in the interior. Feeler gauges are not used to measure a spark plug gap because the surfaces of the electrodes are not perfectly parallel. ***Wire gauges*** (c) or special oval gauges are used for spark plugs.

Feeler gauges



Bent (a), stepped (b) and wire (c) feeler gauges

Before measuring the gap, check and remove dirt and rust from the measuring surfaces. Also, check that feeler gauges are not rusty and, if necessary, lightly lubricate them so that they glide more easily. Feeler gauges are never used to measure machines in operation. After measuring, wipe the feeler gauge set with an oily cloth to prevent rust.

One of the sheets is selected to measure the gap. If the feeler gauge feels too loose when measuring a gap, select the next size larger, and measure the gap again. Repeat this procedure until the feeler gauge has a slight drag between both parts. If the feeler gauge is too tight, select a smaller size until the feeler gauge fits properly.

If you do not have a feeler gauge to measure the desired thickness, you can connect two or more feeler gauges in the sum of which the required thickness is obtained. Also, when you want to measure an unknown gap, you can combine feeler gauges until their thickness fits into that space. By adding the thicknesses of all used feeler gauges, the size of the measured gap was obtained.

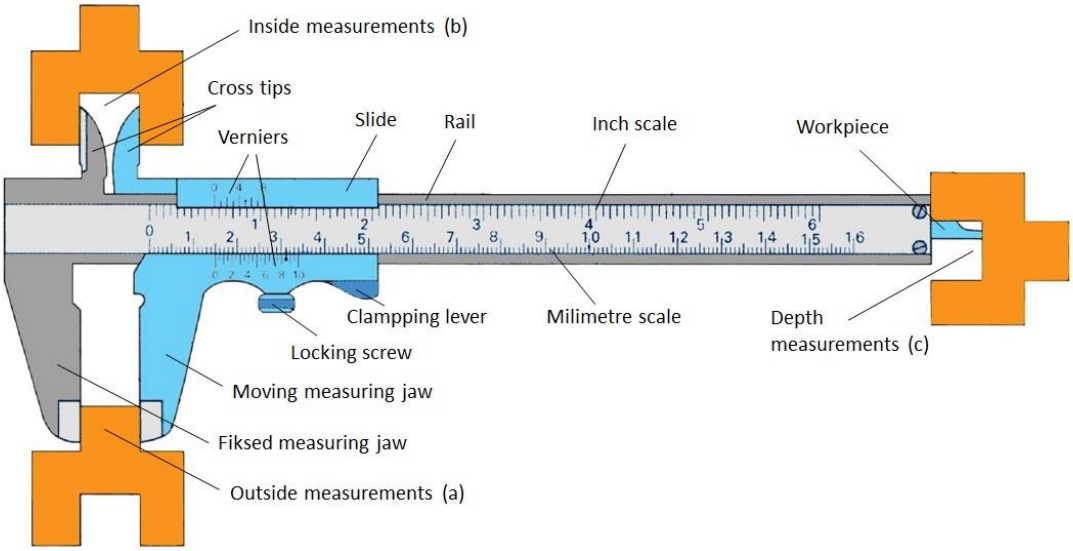
Text 29. VERNIER CALIPER

Source: https://autoedu.info/en/equipment-and-tools/measuring-equipment/vernier-caliper/

Vernier caliper is a measuring instrument used for measuring outside, inside (bore), and depth measurements. It consists of a fixed measuring ruler and a movable measuring scale that are parallel to each other and expressed in mm and inch (upper fixed scale). There is a rail on the upper and lower edge of the ruler. The moving part of the scale on which the vernier scale is located slides on the rail. This scale passes over millimeter and inch scales.

Outside measurements (a) are measured with the help of a larger pair of measuring jaws. In the upper part, there is a smaller pair of measuring jaws that cross each other and serve to measure the inside dimension (b) of an object. When moving the slider, a measuring rod comes out laterally to measure the depth (c).

By moving the slider, the measuring edges are placed on the measuring object. With the help of the clamping lever and the locking screw, the movable scale can be stiffened to maintain the slider in position for accurate readings. The reading is performed by comparing the position of the vernier (moving) scale and the measuring scale on the ruler.

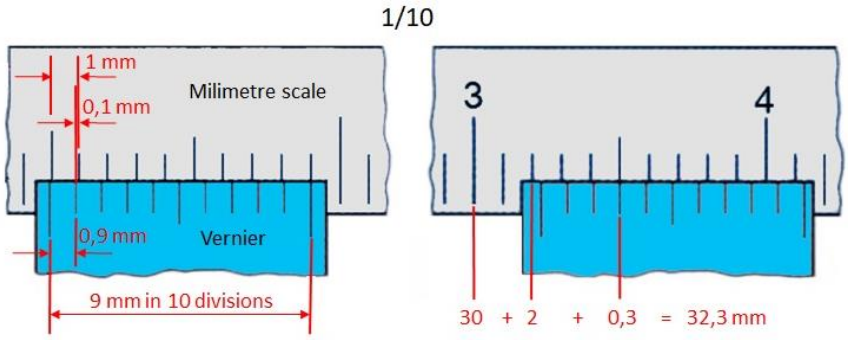


Vernier caliper

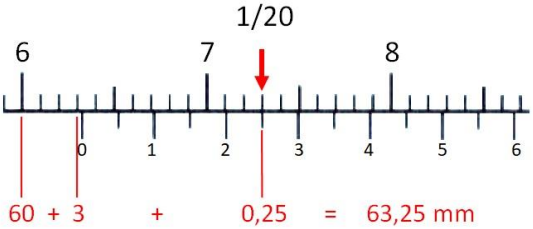
There is a millimeter scale on the fixed ruler. The smallest displayed value is 0.1 mm. The vernier (moving) scale defines the accuracy of the readings of the vernier caliper. The measured value (measurement accuracy) can be read to 1/10 mm = 0.1 mm; 1/20 mm = 0.05 mm and 1/50 mm = 0.02 mm. The vernier caliper in the picture above has a measurement accuracy is 1/10.

With a 1/10 vernier scale, 9 mm are divided into 10 sections. The vernier scale unit is thus 0.9 mm. Readings are thus possible to an accuracy of 1/10 mm. One-tenth of a millimeter is read over the vernier scale.

The reading of the measured value is performed first on a fixed millimeter scale and continues on the vernier scale. The value in millimeters was read up to the vernier scale. The decimal value is read on the vernier scale. When the lines on the millimeter and vernier scale coincide, the value of the number on the vernier scale is the decimal value of the measured quantity.



The vernier scale with an accuracy 1/20, 39 mm is divided into 20 parts. In this case, the vernier graduation is 39 mm/20 = 1.95 mm, and the vernier accuracy is 2 mm – 1.95 mm = 0.05 mm = 1/20 mm.



Technicians often use vernier calipers to measure the length and diameter of bolts, the diameter of the shaft, the depth of blind holes in housings, the outside and inside dimensions of the bearings and the like.

Newer versions of vernier calipers have dial and digital scales. The dial caliper has the main scale on the graduated bar, and fractional measurements are taken from a dial with a rotating needle. These tend to be easier to read than the older versions. More recently, digital scales on vernier calipers have become commonplace. The principle of their use is the same as any vernier caliper. However, they have a digital scale that reads the measurement directly. In both of these versions, it is necessary to zero the meter before starting the measurement.

Dial and digital calipers

Never try to measure the diameter of the shaft while it is rotating as it may injure you and damage the caliper. When measuring, ensure that the measuring surfaces are clean and apply the correct pressure by holding the caliper in the correct position. Start measuring the depth by first leaning on the side of the fixed ruler, and then pulling out the measuring rod. The measuring rod must be at a right angle because if it is beveled, you will get higher measured values. Do not use cross-tips for scribing.

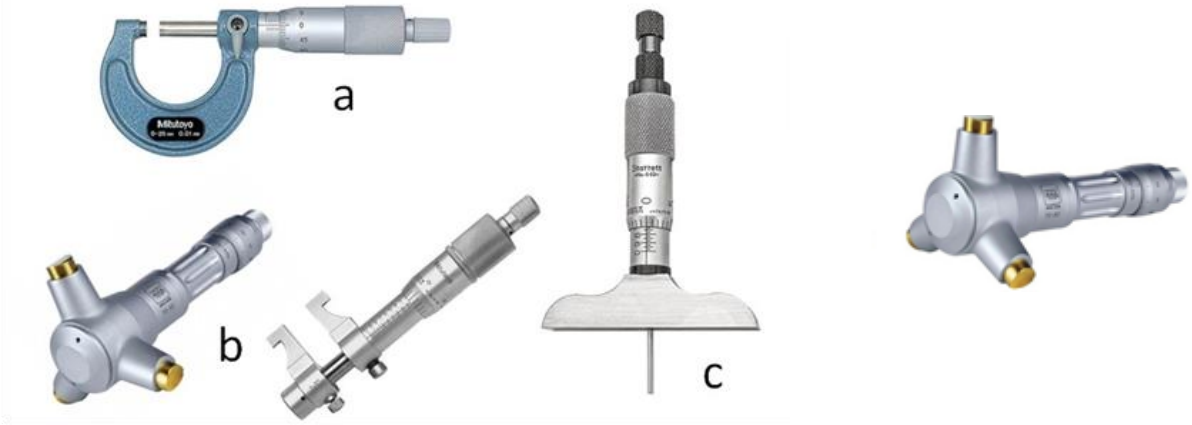
Text 30. MICROMETER

Source: https://autoedu.info/en/equipment-and-tools/measuring-equipment/micrometer/

The ***micrometer*** is a precise measuring instrument for measuring small distances. The most common types are the outside, inside, and depth micrometers. For example, the ***outside micrometer*** could measure the diameter of a valve stem, the ***inside micrometer*** could measure an engine cylinder bore, and the ***depth micrometer*** is measured what is the clearance of the piston below the surface of the engine block.

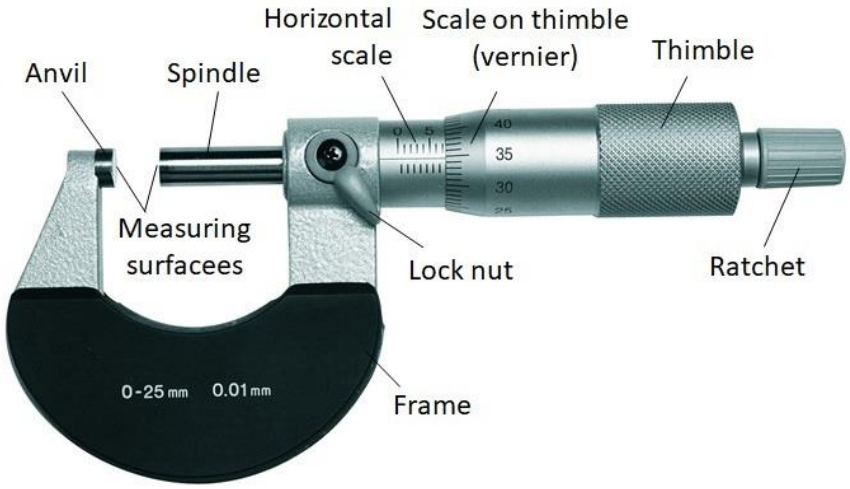
The most common type is an outside micrometer. The frame of the micrometer is in the shape of a horseshoe. Some micrometers on the frame have plastic finger pads to prevent heat transfer to the metal frame which can cause the metal to expand slightly and affect the reading. On one end of the frame is the anvil, which contacts one side of the part being measured. The second contact measuring point is the movable spindle. The micrometer measures the distance between the anvil and spindle so that it corresponds to the distance of the measuring part.

The spindle is over the inside of the sleeve in conjunction with the thimble. When the thimble rotates, the spindle moves forward/backward depending on the direction of rotation of the thimble. The measurement is read on the sleeve/barrel and thimble. The sleeve is stationary and has linear markings on it. There is a horizontal millimeter scale on the sleeve and a vernier scale on the thimble.



Outside (a), inside (b), and depth (c) micrometers *Bore micrometer*

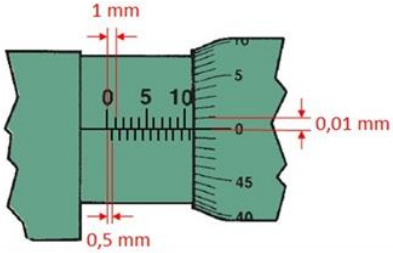
The thimble usually incorporates either a ratchet or a clutch mechanism, which is turned lightly by finger, thus preventing over-tightening of the micrometer thimble when taking a reading. The micrometer on the frame has a lock nut or lock screw which serves to lock the thimble in place while you read the micrometer.



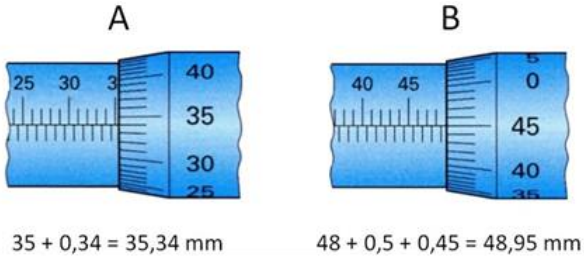
Outside micrometer parts

The thimble is connected to the spindle via a thread. Turning the thimble moves the spindle. The micrometer has a 0.5 mm thread, which means that 1 full thimble rotation is required to move the 1 mm spindle. Each full rotation of the thimble moves the spindle by 0.5 mm, and it takes 50 rotations of the thimble to move the spindle 25 mm.

There are markings on the horizontal scale. The upper row of marks shows the distance per millimeter (1 mm), and the lower string shows half a millimeter (0.5 mm). The scale on the thimble is a vernier and has 49 marks and the value of one division is 0.01 mm.



Micrometer measuring scales



Sample readings

When the measuring surface is covered with a micrometer, the upper horizontal scale, which is visible up to the thimble (example B) 48 mm, is read first. Then the lower one is checked along the horizontal scale and if another lower line is seen, 0.5 mm is added, in our

example, it is now 48 + 0.5 = 48.5 mm. After that, the vernier scale on the thimble is read. We take the value that coincided with the middle line on the horizontal scale, in our example it is 45. Since the vernier scale shows one-hundredth of a millimeter, then we add 0.45 mm. The final value of the distance in example B is 48 + 0.5 + 0.45 = 48.95 mm.

Inside micrometers are used to measure internal measurements. There are two types for measuring the width of the channel and for measuring the diameter of the bore.

A ***bore micrometer*** is used to measure internal diameters of 3.5 mm to 300 mm. This micrometer must be self-centering and usually contains three moving probes to provide a three-point measurement. It is used to accurately measure the diameter of the bore in the machine assembly in which the bearing or other mechanical element of a narrow tolerance field lies, such as the engine cylinder.

For measuring distances in awkward spots like the bottom of a deep cylinder, the telescoping gauge has springloaded plungers that can be unlocked with a screw on the handle so they slide out and touch the walls of the cylinder.

Text 31. DIAL INDICATOR

Source: https://autoedu.info/en/equipment-and-tools/measuring-equipment/dial-indicator/

The ***dial indicator*** is a measuring instrument that has a dial and needle where measurements are read. The measurement is performed via a measuring needle. The measuring needle is connected to the dial needle via a mechanism in the housing. The dial accurately displays the movement of the measuring needle.

Dial indicators are most often used to measure the differences of rotating elements such as the camshaft, disc brakes, etc. Thus, they can be used to measure the trueness of a rotating disc brake rotor. A dial indicator can also measure how round something is, such as a crankshaft, which can be rotated in a set of V blocks. If the crankshaft is bent, it will show movement on the dial indicator as the crankshaft is rotated.

The dial indicator can measure with an accuracy of 0.01 mm. When measuring, the measuring needle must rest on the measuring surface along the entire circumference of rotation, there must be no space. Also, the dial indicator itself must be fixed and not move during the measurement. Most comparators have suitable stands with adjustable arms. The base is made of solid material and has a magnet for fixing.

Dial indicator

Dial indicator on stand

Before measuring, fasten the stand near the measuring object. By adjusting the hinge extensions of the stand, the comparator is set so that the needle is at a right angle to the measuring surface. Tighten all accessories to ensure comparator stability. During the measurement, we observe the dial at a right angle, because a side view can lead to a reading error (parallax).

The measuring object is rotated slightly and the minimum deviation of the pointer is located. In this position, zeroing is performed by turning the dial and placing the zero opposite the measuring needle. This resets the instrument. Further slight rotation observes the deviation of the measuring needle. When the maximum displacement is located during full rotation, it is set back to that position and the value is read on the dial. The read value is the maximum difference or runout of the rotating surface about the axial rotation. Runout is the side-to-side variation of movement when a component is turned.

Text 32. TEST LIGHT

Source: https://autoedu.info/en/equipment-and-tools/measuring-equipment/test-light/

A ***test light*** is used to check for voltage in an electrical circuit. It is in the shape of a screwdriver with a probe and a ground wire attached. There is a light bulb on the holder itself. When the clamp is placed on the ground and the probe touches the live connector, the bulb lights up. This indicates that voltage is available. If the bulb does not light, there is no voltage on the connector. They do not use a separate power source for their work but are powered from the measuring area.

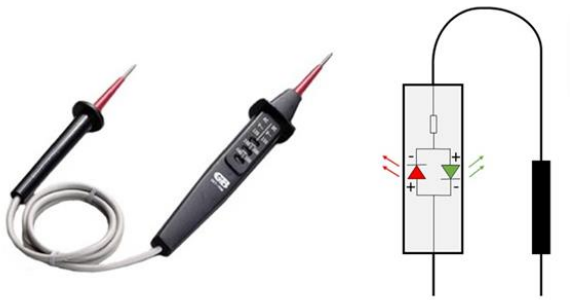
A test light can be used to check for grounds by attaching the clip of the test light to the positive terminal of the battery or any 12-volt electrical terminal. The tip of the test light can then be used to touch the ground wire. If there is a ground connection, the test light will light.

Test lights have a limitation because they do not measure the magnitude of the voltage, but are only an indicator of the existence of voltage. However, this is enough for the technician when examining the correctness of the circuit in search of an interruption.

There are two types of test lights – a bulb, and an LED.

A ***test light with a bulb*** is an older type of test light. The housing is made of transparent material and inside there is a light bulb (12V, 2W). When there is a voltage between the two probes, the bulb lights up. However, during the test, an unwanted supply voltage may be applied to the electronic device via the test lamp and may be damaged. Therefore, it is recommended to use another type of LED test light for testing on modern vehicles.

Test light with a bulb



LED test light

A ***LED test light*** is a newer and safer type of test light has an LED as an indicator of the existence of voltage. The LED test light is a small consumer (0.025 A) and is safe to test in a circuit of electronic devices.

Often these test lights have two LEDs of different colors which, in addition to measuring DC voltage, also provide information on the polarity of the measuring point. For example, if the probe with LED is connected to the plus line, the red LED lights up, and if it connects to the ground (minus), the green LED lights up.

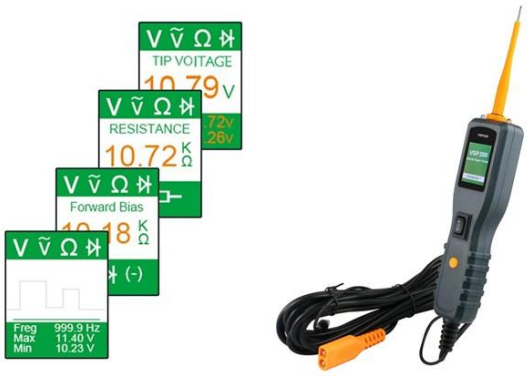
Text 33. CIRCUIT TESTER PROBE

Source: https://autoedu.info/en/equipment-and-tools/measuring-equipment/circuit-tester-probe/

The ***circuit tester probe*** is a multifunctional measuring and testing instrument for quick checking of the condition of the vehicle's electrical networks. It is also used to test the correctness of some electrical components and devices.

The power of the test device is provided from the vehicle battery, by connecting directly to the battery or via the cigarette lighter connection. It can check the condition of the installation for an open, short circuit or voltage drop test. It is capable of measuring DC and AC voltage and showing the magnitude of the voltage or the signal of the AC signal of lower value. It has the functions of a test light because it determines the existence of voltage and polarity.

Checking the condition of the electrical installation or testing the function of an electrical component is done by conducting the power supply (plus or minus) by depressing the power switch.



Circuit tester probe

In addition to voltage, the tester probe measures the resistance and condition of the diode. The circuit tester probe has automatic protection against short circuits or overload so that it is safe during testing and locating faults on the vehicle's electrical installations. This test device is for measuring 12/24 V. It is not for recording signals whose pulses exceed the specified voltage.

Text 34. MULTIMETER

Source: https://autoedu.info/en/equipment-and-tools/measuring-equipment/multimeter/

A ***multimeter*** is an electrical measuring instrument for measuring DC and AC voltage, current, and resistance. More advanced multimeters can measure other quantities such as temperature, capacitance, frequency, state of diodes and transistors, engine speed, pressures, etc. To the way the measured value is displayed, there are multimeters with analog and digital indicators.

The ***analog multimeter*** uses a moving coil meter that moves above the measuring scale. The position of the pointer (needle) shows the value of the measured quantity on the scale.

The instrument has different measuring ranges. The selection of the type of measurement and the measuring range is done with a range selector switch. Before measuring, based on the measured quantity, probes are connected to the appropriate multimeter ports. It selects the type of measurement (DC or AC), electrical measurement quantity (voltage, current, or resistance), and measuring range via the range selector switch. If we are not

sure what the expected value of the electrical quantity is, we start from the largest range and reduce it until we get a deviation of the pointer that is readable. Otherwise, we can destroy the multimeter. Also, we have to pay attention to the polarity because the pointer will move in the opposite direction, which can cause a malfunction of the measuring device.

An analog multimeter measures resistance by measuring the current flowing through a resistor. Therefore, the accuracy of the resistance measurement depends on the condition of the battery in the multimeter. Before each resistance measurement, the instrument must be calibrated to zero. Probes are short-circuited and the pointer is set to zero via the rheostat. When measuring resistance, the current through the resistor is small. When measuring infinitely large resistance, there is no movement of the pointer, and when the resistance value is zero, we have a full deviation. The resistance scale is nonlinear and opposite to the voltage and current scale.

The reading is performed on the appropriate scale for a given measuring quantity and measuring range. When viewing the meter, the eye should be at right angles to the plane of the meter back markings, i.e., looking directly at the meter. If you look at an angle there is an error in reading known as parallax errors.

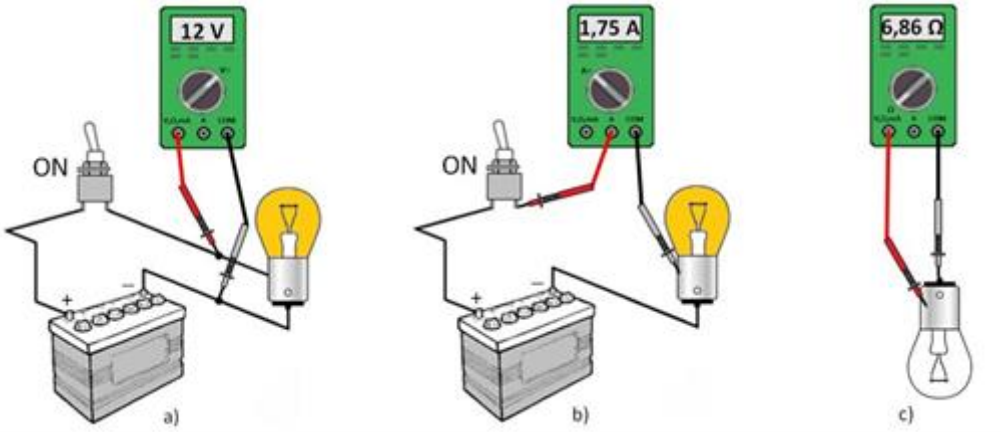
Analog multimeter

Digital multimeter

A ***digital multimeter*** is much more accurate and easier to use than an analog multimeter. When measuring an electrical quantity, it is necessary to select the type and range and the numerical value of that quantity will be shown on the digital display. With some digital multimeters, the measuring range is adjusted automatically.

One of the advantages of this instrument compared to analog is that it is not sensitive to changes in measurement polarity due to incorrect connection. If the polarity is reversed, the measured value is shown on the digital display with a minus sign, which informs us about the polarity.

Digital multimeters have many additional capabilities for measuring and analyzing measured values. In addition, they can measure other physical quantities. Due to their advantages, they completely pushed analog multimeters out of use.



Multimeters are used for:

1. DC ***voltage measurement*** (a) is performed by selecting the appropriate DC voltage measurement range (V⎓) on the selector switch. The black (common) measuring probe is connected to COM port and the red one to V/Ω port. The red probe is typically connected to the positive side of the circuit being tested, and the black probe to the negative post of the battery, or good ground. The DC voltage display shows the value of the DC voltage.

AC voltage measurement requires that the selector switch be placed in the AC voltage measurement position (V~) and it does not matter how we place the probes. Measuring AC voltage always gives positive values no matter how we connected the probes.

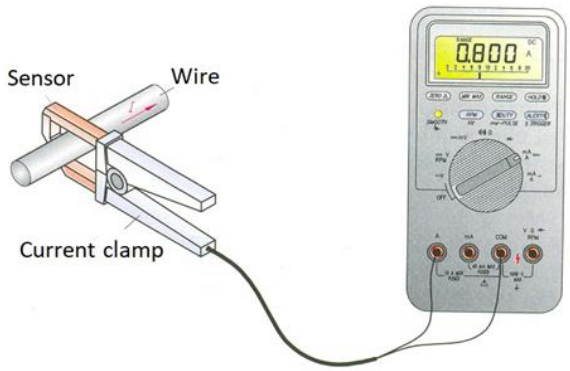
2. ***Current measurement*** (b) is performed by selecting a range for current measurement on the selector switch, and a choice of DC or AC. The black probe is connected to the COM port, and the red probe, depending on the expected value of the current, to the connection for measuring low or high current port. If direct current is measured, then the red probe is connected to the disconnected circuit at the end of the plus power supply, and the black to the other end. When measuring alternating current, the arrangement of probes when connecting is not important. Pay attention to the measuring range because too much current can destroy the measuring instrument.

3. ***Resistance measurement*** (c) requires that a range for resistance measurement (Ω) be selected on the selector switch. Connect probes to COM and Ω. If you need to measure resistance in a circuit, always make sure the power is disconnected. Connecting an ohmmeter into a live circuit usually results in damage to the meter. We place the ends of probes on the leads of the measuring object and the instrument shows us the value of resistance. This option is often used to check for interruptions and short circuits. By selecting this option, an acoustic signal is heard on the switch in the event of a short circuit, and it is absent when interrupted.

Text 35. CURRENT CLAMP

Source: https://autoedu.info/en/equipment-and-tools/measuring-equipment/current-clamp/

Using a multimeter to measure current, it is necessary to disconnect the circuit, which is not always possible to report on the vehicle. Cables are bundled together, placed, and passed through the vehicle body. ***Current clamps*** are used to measure the current on the electrical network of the vehicle without interrupting the circuit.



Current clamp

Digital clamp multimeter

Current clamps are in the form of a clamp that can encompass a wire where we want to measure the strength of the current flowing through that wire. These instruments use the principle of electromagnetic induction that is created around a wire by the flow of electric

current. When the current clamps cover the conductor, the sensor induces voltage from the conductor under the action of a magnetic field. The magnitude of the induced voltage is proportional to the strength of the magnetic field, i.e., the strength of the electric current through the wire. By measuring the induced voltage, the multimeter displays the current through the wire. The current clamp is connected directly to the multimeter via input ports.

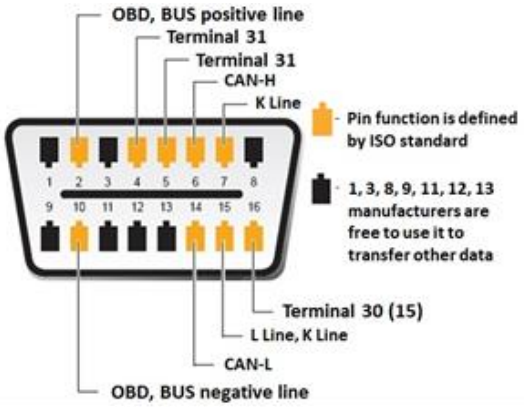
Today, current clamps are an integral part of the multimeter housing, which facilitates the handling and use of the multimeter for measuring current. It is enough to separate the wire from the bundle so that it can be grasped with clamps. When the clamps enclosing the wire are connected, the current can be directly measured and read on the multimeter display. Accurate current measurement with current clamps is possible if they include only one wire.

Text 36. DIAGNOSTIC TOOL

Source: https://autoedu.info/en/equipment-and-tools/measuring-equipment/diagnostic-tool/

The ***diagnostic tool*** is used to connect an external computer to the ECU (electronic control units) on the vehicle. The technician can communicate and access data from ECU vehicles via a computer. This measuring device enables a very acceptable and fast way of finding the type and place of malfunctions on the vehicle. Through self-diagnosis and monitoring of parameters on the ECU, the technician is guided to the place of failure by checking the correctness of the system and its parts. The diagnostic tool can be brand specific to the vehicle manufacturer or universal for all vehicles.

Bosch KTS diagnostic tool



OBD/EOBD diagnostic plug

The computer communicates with the ECU on the vehicle via a diagnostic tool and a diagnostic socket on the vehicle; it accesses fault codes, monitors operation and tests elements and systems, adjusts operating parameters, encodes and updates ECU software. The connection of the diagnostic tool to the vehicle diagnostic connector can be done via the diagnostic cable or Bluetooth. Since the entry into force of the ***OBD*** II and ***EOBD*** protocols, the ***diagnostic plug*** has been universal (16-pin).

The diagnostic tool uses a universal protocol to access the ECU on vehicles. The computer must have the appropriate program for the vehicle to start the system diagnosis process. Part of the diagnostic connectors is reserved by law for communication with ECU vehicles, while other connectors can be used by vehicle manufacturers according to their own needs.

Often, diagnostic tools are multifunctional because, in addition to the diagnostic function, they provide the possibility of measurement and assistance to the technician through the information system.

The measuring device contains a multimeter and an oscilloscope. It is used to measure and display electrical quantities and signals on the vehicle. By analyzing the measured values, the technician can easily determine the correctness of individual elements and systems.

The information system provides service data on vehicles and their parts with a simple and fast search. Today, it is impossible to have all the printed service documentation for all types of vehicles, and the process of browsing that documentation in search of the necessary service information is very slow and uneconomical. That is why the information system has an advantage because it contains all the necessary service information in one place in electronic form. It also guides the technician through the process of testing and detecting the fault. Working on modern vehicles is almost impossible without the use of information systems.

Text 37. AUTOMOTIVE OSCILLOSCOPE

Source: https://autoedu.info/en/equipment-and-tools/measuring-equipment/automotive-oscilloscope/

An ***automotive oscilloscope*** is a digital measuring device specialized for measurements of the vehicle. Various physical and electrical quantities can be measured with this device. The display of the measured quantity is on the screen in the form of a signal or a numerical value.

Automotive oscilloscope

Automotive oscilloscope with connecting probes

Modern automotive oscilloscopes have software support for faster and more accurate measurements. At the same time, this software provides the user with benefits such as: automatic screen adjustment by selecting the measuring object; simultaneous recording of several different measured quantities; instructions for connection and measurement; signal recording and subsequent inspection; storing recorded measured values (signals); comparison of measured and recorded signals; generation of adjustable signals

To measure a physical or electrical quantity on a vehicle, it is necessary to connect an appropriate measuring probe that can measure that quantity and convert it into a proportional voltage signal. The voltage obtained from the measuring probe is sent to the oscilloscope for further processing and display on the screen. The displayed signal or numerical value is in a unit of measured physical or electrical quantity.

Physical quantities that can be measured with an automotive oscilloscope: engine speed; oil temperature; air pressure; fuel pressure, etc. and electrical quantities on the vehicle: battery voltage; charging current; speed signal; primary and secondary ignition voltage; lambda probe voltage and many other sizes.

Control, adjustment and display of measured values are done through the software on the computer.

РАЗДЕЛ 4. ИНСТРУКЦИЯ ДЛЯ ПОДГОТОВКИ УСТНОЙ ПРЕЗЕНТАЦИИ ТЕКСТОВОГО МАТЕРИАЛА НА АНГЛИЙСКОМ ЯЗЫКЕ

4.1. Поэтапная инструкция по подготовке презентации текстового материала Presentation Preparing Guide

STEPS

Step 1. Know the context of the presentation: Who are the audience, and what are their interests? How big will the audience be? How long is the presentation to be? What facilities are available for visual aids? What about time for questions?

Step 2. Decide on your topic. Think carefully about the main point or points that you want to communicate. You should be able to write these clearly in one or two sentences.

Step 3. Structure the content. Most people begin with an unordered collection of ideas and then put them into sequence. Then decide on the relative weight of each section of the talk.

Step 4. Think of ways of catching the listeners' interest: examples, anecdotes, impressive statistics, and interesting quotations.

Step 5. It is useful to 'rough-draft' visual aids at this stage because they can help you make the sequence of points clearer and more logical. Think about whether some information should be put into handouts.

Step 6. Check overall length, and the relative weight of sections. A little too short is better than even a little too long. As a rough guide, allow about 1 minute for every 100 words, plus time, if necessary, for changing transparencies. One A4 page, double-spaced, takes about 3 minutes of speaking time.

Step 7. Finish preparation of visual aids. If you are using PowerPoint data projection, having slides or transparencies is a useful back-up in case of last-minute technical problems.

Step 8. Prepare handouts, if you want them. Make copies.

Step 9. Plan the exact words you will use for the opening, the transition points, and the conclusion. Practice them again and again. If you are anxious, write on cards the introductory and concluding sentences. Make more notes if you need them.

Step 10. REHEARSE your presentation, as often as necessary. Do not omit this step! You can practice alone, or ask a friend or colleagues to listen to you. With practice, you will become more fluent and at ease. Make sure you speak simply, but in academic not conversational style. Project your voice across the room. You will find this slows your speech. Check the timing carefully and make adjustments if necessary. Mark a time reference at one or two points in the presentation.

Step 11. Think about the questions the audience may want to ask you. Plan how you will answer them.

Step 12. On the day of your presentation, be calm and organized. If you are unfamiliar with the location, go beforehand to plan where you will stand and where you will put your papers and to see how the projection works. Arrive in good time for your presentation. Remember to take all your visual aids, notes and papers.

If you feel nervous, do not worry. That's normal. Breathe slowly and deeply for a few minutes beforehand, and try to relax the muscles of your face, mouth and neck. This will make you look relaxed, and will improve the quality of your voice. Then remind yourself how well prepared you are, and enjoy it. Concentrate not on yourself or your notes, but on the audience and making clear to them what you have to say.

Visual aids

If you are using an **overhead projector,** follow steps 1–4 below.

1. Before your presentation, check that the equipment works. Decide on the best place to stand, so that you do not obscure the view of the audience; decide where to put transparencies before and after use; decide whether you will point at the transparency or at the screen (or not at all).

2. If you point at the transparency, use a pen as a pointer.

3. Detach the transparencies from their backing paper to make things easier during your presentation. Interleave them with plain paper.

4. Number the transparencies in case you drop them.

If you are using **Power Point** data projection, follow steps 1–6 below.

1. Check beforehand whether you should bring your presentation on diskette or CD or DVD. If you are bringing a computer, check on the type of connection required for the data projector.

2. If possible, set up your presentation before your talk. This can take several minutes, even if all goes well.

3. Have a blank slide at the start and end of your presentation. This makes your start and finish smooth.

4. Power Point has an excellent online tutorial and help system. Use it when you are preparing your presentation so that you can make full use of its faculties (such as time monitoring, handouts and notes).

5. Don't be tempted, because of Power Point's capabilities, to make your slides too 'busy'. That will distract the audience's attention.

6. Even if you are giving your presentation in a well-equipped room, technology can go wrong. Print out your PowerPoint slides on to transparencies, so that you have an alternative.

Handouts

Handouts are useful in **three ways**.

1. They show data that are too detailed for a visual aid, such as transcript data from interviews, or mathematical calculations. If there is a lot of detail, the points you want to refer to in your presentation should be clearly highlighted in the handout. The handout is given immediately before the presentation, and then referred to.

2. They provide a 'signposting' framework to guide the audience through your talk. In this case, the handout will be a note-frame, which is given out before the presentation. Don't put too much into it, or the audience will read the handout instead of listening to you.

3. They act as a record of your presentation, which the audience can take away. This could be either a note-frame or a fuller text. For this 'record' type of handout, it's common practice to add your address and email address, so that people working in the same field can contact you later. Some presenters like to give out this type of handout at the end of their talk, so that the audience listens with full attention. Others give it out at the start, as a support to listening.

Keep your handout short – one page if possible.

Notes

Visual aids often provide sufficient support for your presentation. If you feel you need notes as well, remember that they will be more to cope with during the presentation: you will have to deal with the visual aids, the notes, and the audience.

1. Cards or A5 paper are often recommended because they are neater in the hand than big pages. Make sure you number them clearly!

2. A good alternative is to use photocopies of your visual aids, with notes written on them. It is then easier to coordinate your progress through notes and visual aids.

3. Write very large and clear, with plenty of space.

4. Use colour, so that you can quickly locate key points or words.

4.2. Технология создания электронной презентации текстового материала

4.2.1. Облако слов

«Облако слов» представляет собой визуальное представление ключевых слов текста. Это – графическая визуализация текста.

1. Зарегистрироваться на сайте **http://tagul.com/**

2. Нажать клавишу My clouds, затем клавишу CREATE NEW CLOUD и зайти во вкладку Tags source (Теги: источник) → URL (вводим адрес веб-страницы) и текст загружается в буфер.

3. Нажать клавишу Visualize, таким образом, текст появится справа.

4. Придать облаку желаемый вид с помощью меню:

Appearance – внешний вид
Font – шрифт
Color – цвет, раскраска слов в облаке
Background color – цвет фона (на экране)
Animation speed – скорость анимации
Roll over text color – развернуть цвет текста
Roll over box color – развернуть цвет рамки
Roll over stroke color – развернуть цвет шрифта
Grab and share – сохранить и поделиться
Save to local computer – сохранить на своем компьютере
Save graphic image – сохранить графическое изображение
Place on a web-page – разместить на веб-странице
Send link to a friend – отправить ссылку другу

5. Сохранить созданное облако, нажав на клавишу Save graphic image. После нажатия появляется окошко «Сохранить как», и вы выбираете место сохранения.

6. Отправить ссылку своим коллегам.

ИЛИ

1. Используя сайт **http://www.tagxedo.com/**, создать **облако слов** из текста.

2. Придать облаку желаемый вид с помощью меню:

Color – цвет
Theme – тема
Font – шрифт
Orientation – ориентация
Layout – расположение слов в облаке
All – всевозможный вариант
Shape – очертание/форма
Hide History – история выполненных действий

3. Сохранить, нажав клавишу Save, и выбрать необходимые параметры сохранения: размер и расширение. После нажатия клавиши сохранить изображение в любом месте на вашем компьютере.

4.2.2. Диаграмма связей / ассоциативная карта

«Диаграмма связей», известная также как «Интеллект-карта», «Карта мыслей» (англ. Mind map), «Ассоциативная карта», – способ изображения процесса общего системного мышления с помощью схем. Также может рассматриваться как удобная техника альтернативной записи.

1. Зайти на сайт **http://freemind.sourceforge.net/**. В пункте **See Download** нажать на **Download** (загрузка). Вы автоматически попадаете на страницу **Download,** где спускаетесь в пункт **Installing Free Mind.**

2. Если компонент Java уже установлен, то нужно нажать на **You can find a Free Mind installer including java here**. После чего начинается автоматическая загрузка файла Free Mind-Windows на ваш компьютер.

3. Установить программу в обычном режиме на компьютер.

4. На рабочем столе появляется значок, который вы запускаете как программу.

5. В центре поля щелкнуть на **Free Mind** / Новая карта и написать центральное понятие, например: «статья о программе Free Mind».

6. Нажать клавишу **Insert /** Вставка для вставки пункта первого уровня (например, «Введение»).

7. Нажать клавишу **Enter** для вставки второго пункта первого уровня (например, «Установка приложения»).

8. Основное редактирование необходимо производить с помощью клавиш **Insert** / Вставка, **Enter** / Ввод, **Escape** / Выход и **Delete** / Удаление.

9. Для редактирования текста внутри выбранного узла можно воспользоваться клавишей **F2.**

10. Можно перемещать карту целиком в любое место рабочего пространства методом обычного **drag'n'drop** / перетаскивание – нужно зажать мышью рисунок и перетаскивать его, не отпуская, в нужное место.

11. Попробуйте изменить размеры узлов. Все возможные формы работы с узлом вы найдете, щелкнув по узлу правой кнопкой мыши, в пункте «Формат».

12. Нажатием сочетания клавиш **Alt+I** откройте каталог с предустановленными иконками («Выберите пиктограмму»). Вы можете выбрать любую из них для добавления к узлу на вашей карте. Добавление иконок делает ее более читаемой и интуитивно понятной.

4.2.3. Шаги по созданию и работе с узлами ассоциативной карты

1. Щелчок мышью по «**Новой карте**» дает возможность внести ключевое слово. Нажав клавишу **Enter**, вы закрепляете данное ключевое слово.

2. «**Вставка → Новый смежный узел после текущего**» дает возможность создать узел с правой стороны.

3. «**Вставка → Новый смежный узел перед текущим**» дает возможность создать узел с левой стороны.

4. Щелчок **левой** кнопкой мыши по «**Новому смежному узлу**» дает возможность внести название для созданного узла.

5. Выполнение щелчка **правой** кнопкой мыши обычно приводит к отображению **списка доступных действий** для **работы с узлом:**

Редактировать F2	Изменение названия узла
Изменить текст в редакторе	Форматирование шрифта: цвет, курсив, жирный шрифт, подчеркивание, выравнивание, вставка таблицы, создание списка, создание нумерации

Редактировать атрибуты	Создание таблицы с атрибутами под названием узла
Удалить узел	Удаление узла
Вырезать	Удаление узла из данного места и вставка в другом месте
Копировать	Копирование узла и вставка в другом месте
Копировать только этот узел	Копирование только этого узла и вставка в другом месте
Вставить	Вставка узла
Новый подчиненный узел	Создание нового узла, подчиненного заданному узлу
Новый смежный узел после текущего	Создание нового смежного узла **под** существующим узлом
Новый смежный узел перед текущим	Создание нового смежного узла **над** существующим узлом
Развернуть/свернуть	Развёртывание и свёртывание подчиненного узла
Пиктограммы ***здесь же:***	Вставка пиктограмм из предложенного списка
Удаление последней пиктограммы	Удаление последней пиктограммы в данном узле
Удаление всех пиктограмм	Удаление всех пиктограмм в данном узле
Экспортировать ветвь как новую карту Alt+Shift+A	Экспорт данной ветви в новую карту, т. е. перенос в новое окно, где с ней можно отдельно работать (в главной карте появляется ссылка на этот элемент ассоциограммы)
Формат	**Работа с узлом** Тип узла – овал, кривая Увеличить шрифт узла Уменьшить шрифт узла Курсив Жирный Цвет узла Высветлить узел Фоновый цвет узла Убрать фоновый цвет узла Цвет облака (облако создается в вставке) Цвет ребра (прямая, кривая, заостренная прямая, заостренная кривая) Толщина ребра (как у родительского узла, тонкое ребро, 1, 2, 4, 8)
Вставка	Облако Изображение из файла (Alt+K) Ссылка (выбор файла) – вставка файла через ссылку Ссылка (текстовое поле) Создать связь (выделив минимум два узла) / между узлами
Стиль	Изменение стиля текста в рамках узла

6. Если подвести курсор к узлу – появится значок на повороте узла, и **узел** можно **перенести** в другое место, потянув в нужном направлении.

7. Файл – экспортировать – как… (выбираем формат, в нашем случае PDF). Сохранить созданную ассоциативную карту связей.

4.2.4. Ментальная карта

1. Зайти на сайт http://www.spiderscribe.net/ (предварительно зарегистрировавшись).

2. Создать новую ментальную карту – **Create New Map.**

3.Задать имя папки – **Map name**.

4. Добавить описание данной папки – **Description**.

5. Кликнуть по иконке «**Текст**» и, удерживая кнопкой мыши, перетащить на поле. Ввести текст.

6. Отформатировать текст по желанию: справа на экране панель форматирования текста. Изменить фон окна, шрифт, кегль текста (размер шрифта).

7. Щелкнуть по знаку «+» и создать новую ветвь.

8. Кликнуть по иконке «**Изображение**» и, удерживая кнопкой мыши, перетащить на поле.

9. Щелкнуть на кнопку загрузки **Upload image** и загрузить изображение. Отформатировать изображение по желанию: справа на экране панель форматирования изображения.

10. Проделать похожие шаги с картой, календарем, документом Word.

11. Внести дополнительные изменения в работу с ментальной картой: в верхней части экрана находится **Панель инструментов**: отмена последнего действия, центрирование карты, изменение размера, печать, экспортирование карты, удаление карты.

12. После окончания работы с картой нажать на **Share** (поделиться) – в правом верхнем углу экрана.

Private – Частные (по умолчанию) – карта видна только владельцу и тем, с кем автор поделился (указать электронные адреса).

Public with the link – Общедоступная со ссылкой – карта видна всем, кто имеет ссылку. Вход в аккаунт SpiderScribe.net не требуется.

Public on Internet – Опубликованная в Интернете – карта видна и доступна всем.

При выборе режима **Private**в левом поле ввести список людей, которым разрешен доступ к карте. Выбрать формат доступа: **readers** – только чтение, **editors** – редактирование. Нажать кнопку **Save** (сохранить). Сохранить. Предоставить доступ одному из участников. **Или:** выбрать режим **Public on Internet,** скопировать адрес карты и сохранить в отдельном документе. Нажать кнопку **Save** (сохранить).

Нажать в верхней части экрана на **Export Map** (экспортировать карту) и выбрать формат JPG.

РАЗДЕЛ 5. МЕТОДИЧЕСКИЕ РЕКОМЕНДАЦИИ ПО ОРГАНИЗАЦИИ САМОСТОЯТЕЛЬНОЙ РАБОТЫ INDEPENDENT WORK GUIDE

5.1. Рекомендации по организации работы с текстами для чтения

Чтобы научиться понимать и переводить иноязычный текст, необходимо в первую очередь научить студента выделять и понимать содержание на уровне *текста, абзаца* и *предложения,* а также дифференцировать основную и второстепенную информацию.

Основные признаки текста: 1) *связность;* 2) *тематичность* (все предложения объединены какой-либо одной темой); 3) *цельность* (использование средств связи между предложениями).

Тема текста. Текст представляет собой сложное суждение, в котором есть текстовый субъект (о чем говорится в тексте?) и текстовый предикат (что говорится в тексте?).

Текстовым ***субъектом*** является тема текста, которая находит словесное выражение чаще всего в заголовке или в самом начале текста.

Текстовый ***предикат*** представляет собой группу суждений, раскрывающих тему текста, т. е. сам текст.

Главное содержание текста. Понять содержание текста – значит уяснить его тему и идею.

Тема текста – это предмет данного описания, т. е. предмет, явление, событие, о которых идет речь в тексте.

Идея текста – это главная мысль о данном предмете, авторское отношение к описываемому предмету. Идея текста – это вывод, к которому должен прийти читающий после ознакомления с содержанием текста.

Тема часто сообщается в заголовке или в первом предложении текста. Понять идею можно лишь после прочтения всего текста. Иногда она не имеет словесного выражения, тогда читающий должен сам сделать определенные выводы.

Основное содержание текста. Для этой цели выделяются элементы, в которых заключена основная смысловая информация текста. Они называются «ключевыми фрагментами» (слово, словосочетание, предложение, группа предложений). Каждый абзац имеет ключевое предложение – «абзацную фразу», если их объединить, то можно получить основное содержание текста.

Ключевое предложение может находиться: а) в верхней части абзаца (*дедуктивная* структура – изложение мысли от общего к частному); б) в нижней части абзаца (*индуктивная* структура – изложение мысли от частного к общему); в) в верхней и в нижней части (*рамочная* логическая структура).

Другие предложения текста представляют собой способ логического развития мысли в абзаце.

Формы передачи информации. Существуют следующие формы передачи информации: *сообщение, описание, повествование и рассуждение.* Так, ядро самого простого типа информации – сообщения – составляют ответы на следующие вопросы: кто, что, когда, где, как, почему.

В текстах психолого-педагогического профиля преобладает тип информации о ситуации или положении дел, а также комбинированный тип информации (сообщение, передача высказывания, информация о событии или факте, о ситуации или положении дел, рассуждение).

Основные виды текстов для чтения

1) учебный;

2) художественный (story – рассказ, play – пьеса, novel – роман);

3) научный и научно-популярный (research work – научный труд, theses – диссертация; monograph – монография; reference – статья из справочной литературы; article – журнальная статья; notes – сообщение).

5.2. Методические рекомендации для студентов

5.2.1. Чтение с полным пониманием прочитанного

Цель – полностью понять содержание текста, выделить главную информацию, передать содержание, оценить его, сравнить с уже известным ранее.

Алгоритм

1. Перед чтением спрогнозируйте по заголовку содержание текста.
2. Читайте текст с полным пониманием, т.е. старайтесь как можно точнее понять содержание и смысл читаемого.
3. Проверьте, насколько хорошо вы поняли содержание и смысл текста. Для этого необходимо:

– ответить на вопросы к тексту, позволяющие выделить детали;
– самостоятельно поставить вопросы к тексту;
– составить развернутый план прочитанного.

4. Для подготовки *пересказа* текста необходимо:

– найти в тексте и выписать основные ключевые слова и выражения;
– составить последовательность фактов и событий;
– изложить содержание текста с опорой на ключевые слова и выражения.

5. Для *характеристики* какого-либо объекта текста необходимо:

– определить объект характеристики;
– выписать слова и выражения, относящиеся к определяемому объекту;
– описать объект;
– высказать свое мнение о нем.

6. Для подготовки *высказывания* по проблеме текста следует:

– определить исходный тезис;
– определить основной материал для аргументирования;
– выписать ключевые слова и словосочетания;
– аргументировать тезис;
– привести примеры.

7. Для *обсуждения проблемы* текста следует:

– выделить предмет обсуждения;
– выделить информацию о предмете;
– выписать ключевые слова и словосочетания;
– выразить свое отношение к предмету;
– аргументировать свою точку зрения.

8. Для *реферирования* текста необходимо:

– зафиксировать основные опорные пункты;
– распределить информацию по степени важности.

9. Для *аннотирования* текста следует:

– зафиксировать тему и главную мысль;
– выразить свое отношение.

5.2.2. Чтение с пониманием основного содержания

Цель – получить общую информацию о содержании текста, выделить главную мысль, высказать свое отношение к прочитанному.

Алгоритм

1. Перед чтением спрогнозируйте по заголовку содержание текста.
2. Читайте текст с пониманием основного содержания, то есть сконцентрируйтесь на основных фактах текста, опуская второстепенную информацию;
3. Старайтесь охватить взглядом все предложение или его часть;
4. Старайтесь догадаться о значении незнакомых слов или обратитесь к словарю;
5. Во время чтения подчеркивайте или выписывайте словосочетания и предложения, несущие основную информацию.
6. Проверьте, поняли ли вы основные факты текста, определите его основную мысль. Для этого необходимо:

– выбрать заголовок из предлагаемых вариантов или сформулировать самому;
– разделить текст на смысловые отрезки;
– ответить на вопросы, выделяющие основную информацию.

7. Для подготовки высказывания следует:

– сформулировать главную мысль текста;
– сказать, что вы узнали нового;
– кратко изложить основные идеи текста;

5.3. Рекомендации для написания рефератов, аннотаций

Реферат, составленный по одному источнику, называется *монографическим*. Структура реферата строго установлена. Он состоит из двух частей: *заголовочной* и *собственно реферативной*. В заголовочной части отражается название первоисточника, фамилия автора и библиографические данные (место издания, издательство, год издания).

Текст собственно реферативной части строится на основе выделенных при чтении ключевых слов и ключевых фрагментов, большинство из которых могут быть терминами в данной специальной области.

Реферат, составленный по нескольким работам на одну тему, называется *обзорным*.

5.3.1. Рекомендуемые клише для оформления реферата на английском языке

The Paper is called = The title of the Paper is…– Название реферата…
The theme of the Paper is… – Тема реферата…
It is spoken about… –Говорится о…
It is said in brief that… – Кратко говорится о…
Reader's attention is drawn to…– Внимание читателей привлекает…
The text gives information about… – Текст дает информацию о…
The following facts are stressed in the article…– В статье подчеркиваются следующие факты…
The content of the text includes…– Содержание текста охватывает…
The text is devoted to the problem…– Текст посвящен проблеме…
The articles are taken from… – Статьи взяты из…
In the article it is analyzed… – В статье анализируется…
The author characterises… – Автор характеризует…

The author emphasizes … –Автор подчеркивает, что…
The author suggests… – Автор предлагает…
The author considers that… – Автор считает, что…
The main (sufficient) part of the research work contains… – Главная часть исследования содержит…
The text contains statistics about…– Текст содержит статистику о…
In the introductory part the author touches upon…– Во вступительной части автор касается…
At first it is depicted that… – Во-первых, изображается…
Secondly it is revealed that… – Во-вторых, обнаруживается, что…
First of all, it is stressed that… – Вначале ударение делается на…
The author underlines that… – Автор подчеркивает, что…
In concluding paragraphs, it is pointed out…– В заключительных параграфах указывается на…
Summing up the information… – Подводя итог…

5.3.2. Алгоритм составления реферата

1. Оформите заголовочную часть: запишите название первоисточника, фамилию и инициалы автора (авторов) и библиографические данные.
2. Пронумеруйте абзацы текста.
3. Просмотрите текст и определите его главную тему.
4. Внимательно читая текст по абзацам, определите тему и подтемы каждого абзаца и запишите их вместе с номером абзаца в виде ключевых слов и выражений.
5. Таким образом вы составите логический план текста.
6. Обдумайте последовательность расположения пунктов плана.
7. Выберите из каждого абзаца ключевые фрагменты (отдельные слова или словосочетания), которые характеризуют выделенные вами темы и подтемы, запишите их. Так выявляются смысловые ряды.
8. На материале смысловых рядов составьте текст реферата, используя связующие специфические выражения и языковые клише.
9. Прочитайте составленный текст реферата и отредактируйте его.
10. Укажите свою фамилию и инициалы, факультет, курс, номер группы и дату.

5.3.3. Клише для обсуждения реферата

To my mind the Paper is… – По моему мнению, реферат…
From my point of view… – С моей точки зрения…
It seems to me that… – Мне кажется, что…
I would like to express my own opinion on the problem… – Хотелось бы высказать свое мнение по проблеме…
I would like to clarify… – Я хотел бы кое-что прояснить…
I would like to tell something else… – Я хотел бы сказать следующее…
I would like to add… – Я хотел бы добавить…
An example of this would be… – Примером этого будет…
For example, … – Например…
The point is that… – Смысл в том, что…
Обсуждение
I disagree with the position of the author. – Я не согласен с позицией автора.

I do not share the author's point of view. – Я не разделяю точку зрения автора.

I have just the opposite idea. – У меня противоположное мнение.

I can't agree with the author's opinion. – Я не могу разделить мнение автора.

Согласие

I do share the author's opinion that… – Я разделяю мнение автора в том, что…

I agree with your point of view that… – Я согласен с вашей точкой зрения, что…

You are defenitely right that… – Несомненно, вы правы, что…

I find this Paper interesting / important. – Я нахожу данный реферат интересным / важным.

There is no doubt that… – Нет сомнений в том, что…

It goes without saying… – Без сомнений, …

Сомнение

I am not quite sure that… – Я не вполне уверен, в том что…

It eems to me doubtless because… – Это кажется мне сомнительным, потому что…

I agree to the point but…– Я согласен с этим, но…

I suppose you are right but… – Предполагаю, что вы правы, но…

I would like to mention that… – Хотелось бы упомянуть, что…

Требование, просьба

I would like to ask a question… – Я хотел бы задать вопрос…

Could you tell me more about… – Не могли бы вы рассказать о…

Do you know anything else about… – Знаете ли вы еще что-нибудь о…

Can you confirm the fact? – Вы можете подтвердить… ?

I would like to ask you to tell your opinion about… – Я хотел бы вас попросить высказать свое мнение о…

5.3.4. Аннотирование текста

Аннотация – короткая справка о печатном произведении, излагающая содержание в виде перечня его основных вопросов. Аннотация дает представление только о характере оригинала (книга, статья и т. д.), о его строении (перечень вопросов), о его назначении (на кого оригинал рассчитан), а также об объеме оригинала (количество страниц). Аннотации пишутся как на языке оригинала, так и на родном языке. При составлении аннотации используются языковые клише. Объем аннотации составляет 0,5 страницы.

Структура аннотации стабильна. Она состоит из заголовочной части (название оригинала, фамилия автора, издательство, место и дата издания и др.). Написание собственно аннотации начинается с чтения текста и нумерации абзацев, определяется ведущая тема текста, темы и подтемы каждого абзаца, составление логического плана текста в виде перечня тем и подтем текста.

Клише, используемые при составлении аннотации:

а) клише, начинающие аннотацию и вводящие в главную тему:

The article (text) is called…

The title of the article (text) is…

The article (text)is published in…

The article is printed in…

The article consists of…

The article is devoted to…

The text touches upon the probleme…

In the introductory part the author points out…

в) клише, оформляющие основную мысль произведения:

The author raises the problem of…

The main part of the text informs about…

The article contains statistics about…

с) клише, оформляющие выводы автора оригинала:

In the concluding paragraphs it is pointed out…

Summing up the information it is important to say that…

Generalizing the information, it is necessary to say that…

В конце аннотации указывают фамилию, инициалы составителя, факультет, курс, группу, дату составления.

Например:

Summary

The article is called 'English for Specific Purposes in Russia: a Historical Perspective'. The article is published in Journal 'ESP Russia' in January, 1996. Volume 1. It is written by Tamara Nazarova, Professor of Moscow State University. The article is devoted to historical development of an approach of language teaching which is directed by specific and apparent reasons for learning.

The author raises two problems for identification. The 1st is: What is the meaning of the word ESP? And the 2nd: How to use it?

In the concluding paragraphs it is pointed out that ESP methodology has been consistently applied to intellectual communication at large. Summing up the information it is important to say that as it is shown, terminologies of usage differ in various sciences, but the category of reproduction allows the learner to acquire proficiency in the use of neutral 'prefabricated units'.

5.4. Рекомендации для разработки проектов

Проектное обучение представляет собой технологию активной познавательной деятельности студентов, в основе которой лежит разработка в ходе самостоятельной (групповой или индивидуальной) исследовательской деятельности различных типов проектов – перспективных заданий, направленных на решение задач практики.

Участники проектной деятельности должны ответить на вопросы:

1. Что является целью проектной деятельности?
2. В чем актуальность (оригинальность, ценность) идеи проекта?
3. На решение каких задач практики он будет направлен?
4. Каков будет результат (продукт)?
5. Где он может быть применен?
6. Как он может изменить ситуацию?

Типы проектов в вузе:

– *исследовательские* проекты, подчиненные логике исследования и имеющие структуру, приближенную или полностью совпадающую с научным исследованием;

– *информационные* проекты (модуль исследовательского), направленные на поиск, знакомство и представление информации;

– *практикоориентированные* проекты, имеющие профессиональную направленность, результат которых ориентирован на социальные интересы самих студентов.

Процесс работы над проектом многоступенчатый. В таблице представлены этапы и содержание проектной деятельности.

Этапы работы над проектом	**Содержание работы**	**Деятельность студентов**
Подготовка	Определение реальной ситуации, ее осмысление, рождение задачи (проблемы) из описания ситуации, постановка вопросов	Анализируют ситуацию, выявляют проблему, рассматривают актуальность ее решения
Прогнозирование и целеполагание	Прогноз изменения ситуации, постановка личностных и коллективных целей, их осознание	Обсуждают. Прогнозируют. Определяют цели
Планирование	Определение источников, способов сбора и анализа информации, форм представления результатов. Установление критериев оценки процесса и результатов. Распределение задач между членами групп	Разрабатывают план действий. Определяют и распределяют задачи. Вырабатывают критерии оценки результатов
Реализация	Сбор информации. Работа над проектом. Решение промежуточных задач. Получение запланированных результатов	Выполняют свою часть проекта. Промежуточное обсуждение хода реализации проекта
Оформление и представление	Формы представления устного и письменного отчета. Оппонирование	Отчитываются, обсуждают, представляют результаты для внедрения в практику
Мониторинг и рефлексия	Интерпретация и анализ процесса и результата. Внешняя оценка. Рефлексия студентов по поводу авторства в проекте. Формулирование выводов. Новое целеполагание	Анализируют, интерпретируют, оценивают в ходе коллективного обсуждения и самооценок

Параметры внешней оценки проекта:

– значимость и актуальность проблемы;

– корректность используемых методов исследования и обработки полученных результатов;

– активность каждого члена проектной группы в соответствии с его индивидуальными возможностями;

– характер принимаемых решений, общения, взаимопомощи;

– глубина проникновения в проблему, привлечение знаний из других областей;

– эстетика оформления результатов проекта;

– умение аргументировать, доказывать, делать выводы и заключения, отвечать на вопросы.

5.5. Общие практические рекомендации для изучающих иностранный язык

Владение иностранным языком на современном этапе развития общества играет важную роль в формировании личности человека, свидетельствует о его высоком образовательном и культурном уровне. Изучение иностранного языка, с одной стороны, занятие довольно увлекательное, а с другой – очень непростое. Помимо интереса и желания оно требует больших усилий и терпения, значительных временных затрат, постоянной систематической работы.

Для организации успешной самостоятельной работы по овладению иностранным языком предлагаем вам несколько практических советов:

1. Регулярно занимайтесь языком. Не допускайте длительных перерывов, так как процесс забывания иноязычной информации происходит быстрее, чем в родном языке.

2. Составляйте собственный план работы над языком на день, неделю, месяц и старайтесь его выполнять.

3. Фиксируйте свои достижения в изучении иностранного языка. Помните, язык – беспредметен и безграничен, и каждое усвоенное слово или явление языка обогащает ваши знания.

4. Старайтесь сделать свои занятия разнообразными и интересными, используя различные виды деятельности: работу над произношением, выполнение грамматических упражнений, перевод, чтение вслух, прослушивание аудиокассет, просмотр телепрограмм, видеокассет или дисков с повторением и имитацией диктора, составление небольших ситуаций и рассказов, исполнение песен на иностранном языке и др.

5. Старайтесь больше учить наизусть стихов, песен, считалок, поговорок, диалогов, выражений речевого этикета, фрагментов текстов. Все это тренирует вашу память, расширяет ваши знания иностранного языка.

6. Будьте настойчивы и терпеливы в изучении языка. Здесь, как нигде, действует принцип перехода количественных изменений в качественные. Будьте активны, участвуйте во всех мероприятиях на иностранном языке, настраивайтесь на успех и добивайтесь его.

ЛИТЕРАТУРА

1. Dictionary of Agriculture/ by Alan Stephens. – Finland: Peter Collin Publishing, 1996
2. Oxford Advanced Learner's Dictionary of Current English / by A.S. Hornby. – Oxford University Press, 1999
3. Encyclopedia Wikipedia [Электронный ресурс]. – Режим доступа: https://en.wikipedia.org
4. Lingua. CD-ROM, ABBYY 11.
5. Dave Willis, John Wright Basic Grammar // The University of Birmingham// Harper Collins Publishers, 2000
6. Oxford Living Grammar Intermediate // Norman Coe // Oxford University Press 2009
7. 'English for Car mechanics' Английский язык для автомехаников: учебно-методическое пособие по английскому языку / Р.В. Бичегкуева – Иркутск: Иркутский техникум машиностроения им. Н.П. Трапезникова, 2021. – 52 с. – [Электронный ресурс]. – Режим доступа: https://япедагог.рф/wp-content/uploads/2021/02/English-for-Car-mechanics-2021.pdf (дата обращения: 20.01.2024)
8. English for Bachelors and Masters = Английский для бакалавров и магистров: / А.А. Волкова, Е.В. Добровольская, Е.Г. Коротких [и др.]; научный редактор А.А. Волкова; Новосибирский государственный педагогический университет. – 2-е изд. – Новосибирск: Изд-во НГПУ, 2014. – 170 с.
9. *Коротких Г.И.* Бизнес-английский: Пособие для подготовки к учёбе, стажировке или работе за рубежом. – Кемерово: Изд-во КемГУ, 2000. – 112 с.
10. *Cummings M.C.* Listen, Speak, Present: A Step-by-step Presenter's Workbook / M.C. Cumming. – Heinle&Heinle Publishers Inc. – Boston, Massachusetts, 1992.
11. *Modern* organizations: theory and practice / edited by Ali Farazmand / - 2nd ed. – Greenwood publishing Group Inc, USA, 2002. – 307 p.
12. The Engineers Post [Электронный ресурс]. – Режим доступа: https://www.theengineerspost.com (дата обращения: 20.01.2024)
13. Engineering Learn [Электронный ресурс]. – Режим доступа: https://engineeringlearn.com (дата обращения: 20.01.2024)
14. Engineering Choice [Электронный ресурс]. – Режим доступа: https://www.engineeringchoice.com (дата обращения: 20.01.2024)
15. The Mechanical Engineering | Free Blog for Engineers [Электронный ресурс]. – Режим доступа: https://themechanicalengineering.com (дата обращения: 20.01.2024)
16. Design & Engineering [Электронный ресурс]. – Режим доступа: https://learnmechanical.com (дата обращения: 20.01.2024)
17. Learn Mechanical Engineering [Электронный ресурс]. – Режим доступа: https://learnmech.com (дата обращения: 20.01.2024)
18. Comprehensive Learning Program for Technical & Vocational Students [Электронный ресурс]. – Режим доступа: https://studentlesson.com (дата обращения: 20.01.2024)
19. Easy Car Electrics [Электронный ресурс]. – Режим доступа: https://www.easycarelectrics.com/ (дата обращения: 20.01.2024)
20. Automotive Education Procedures [Электронный ресурс]. – Режим доступа: https://autoedu.info (дата обращения: 20.01.2024)
21. Presentations that move audiences [Электронный ресурс]. – Режим доступа: https://prezi.com/ (дата обращения: 20.01.2024)
22. Презентация по английскому языку [Электронный ресурс]. – Режим доступа: https://present5.com/prezentaciya-po-anglijskomu/ (дата обращения: 20.01.2024)

Составители: ***Сементовская Елена Юрьевна***
Коротких Елена Геннадьевна

ENGLISH FOR AUTOMOTIVE MECHANICS

Учебно-методическое пособие

Печатается в авторской редакции
Компьютерная верстка: В.Я. Вульферт

Подписано к печати.
Формат 60 × 84 ⅛. Тираж 100 экз.
уч.-изд. л., усл. печ. л.
Заказ №

Издательский центр «Золотой колос»
Новосибирского государственного аграрного университета
630039, Новосибирск, ул. Добролюбова, 160, каб.106.
Тел. (383) 267-09-10, e-mail: 2134539@mail.ru