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АГРАРНЫЙ УНИВЕРСИТЕТ

Факультет экономики и управления

ENGLISH FOR STUDENTS OF AUTOMOTIVE FLEET AND VEHICLE TECHNICAL MAINTENANCE

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



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Учебно-методическое пособие содержит аутентичные тексты, раскрывающие предмет, понятийную область и актуальные вопросы всех технических специальностей. Тексты помогут освоить специальную лексику профессиональной сферы, сформировать компетенцию владения английским языком на уровне профессионального общения.

Предназначено для студентов, магистрантов и аспирантов, обучающихся по всем направлениям подготовки Инженерного института очной и заочной формы обучения и имеющих уровень владения английским языком В1-В2. Пособие также может быть использовано для курса повышения квалификации «Профессиональный иностранный язык».

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ПОЯСНИТЕЛЬНАЯ ЗАПИСКА

Учебно-методическое пособие «English for Students of Automotive Fleet and Vehicle Technical Maintenance» ориентировано, прежде всего, на бакалавров и магистрантов, обучающихся по направлению подготовки «Эксплуатация транспортно-технологических машин и комплексов», профили «Автомобильный сервис» (бакалавриат), «Автомобили и автомобильное хозяйство» и «Техническая эксплуатация автомобилей» (магистратура).

Данное учебное пособие может быть использовано на занятиях со студентами, магистрантами и аспирантами всех направлений подготовки Инженерного института очной и заочной форм обучения. Методические разделы учебного пособия «Инструкция для подготовки устной презентации текстового материала на английском языке», «Методические рекомендации по организации самостоятельной работы», а также раздел второй «Работа с текстовым материалом делового характера» позволяют использовать материал пособия для занятий по дисциплине «Деловой иностранный язык», а также для самостоятельной работы студентов, магистрантов и аспирантов всех направлений подготовки Новосибирского ГАУ. Издание может быть использовано в научно-исследовательской работе магистрантов и при подготовке к сдаче кандидатского экзамена по английскому языку.

Пособие рассчитано на 60-70 часов аудиторных занятий и 80 часов самостоятельной работы, что соответствует базовым стандартам ФГОС второго и третьего уровней подготовки.

В основных разделах пособия представлены:

- 1) учебно-тематические блоки (Units) профессиональной направленности, разделённые на 3 тематические группы – Book 1, Book 2, Book 3;
- 2) текстовый и методический материал для изучающего, ознакомительного чтения, ориентированный на деловой аспект профессиональной подготовки;
- 3) обширный банк текстов профессиональной направленности, сгруппированный по 4 темам;
- 4) рекомендации и справочный материал для эффективной подготовки профессиональной и научной презентации;
- 5) методические указания по организации самостоятельной работы.

Материал раздела первого разделён на тематические группы (Books) и организован в учебно-тематические блоки (Units). **Book 1** состоит из 6 юнитов, знакомящих студентов с их будущей профессией, историей развития автомобильной промышленности, современными технологиями изготовления автомобилей, технологиями контроля над качеством выпускаемых автомобилей, проектированием новой автомобильной техники, механизмов и деталей, а также видами транспортных средств. **Book 2** состоит из 11 юнитов, которые описывают строение автомобиля, его основные системы, части и детали. **Book 3** включает в себя 9 юнитов, которые затрагивают автомобильный сервис, техническую эксплуатацию автомобилей, техническое обслуживание и текущий ремонт автомобилей в автомобильном хозяйстве (автопарке), диагностику основных неисправностей транспортных средств и способы их устранения, компьютерные средства диагностирования, цифровизацию в сфере управления перевозками, осуществление технического контроля над коммерческим транспортом, использование компьютерных технологий, инновационных цифровых решений (машинное обучение, искусственный интеллект и т.п.) для улучшения транспортной индустрии и логистики, оборудование для станций технического обслуживания, современную технику, приборы и иное оборудование для авторемонтной мастерской.

Каждый блок открывается основным, тематически ведущим текстом для изучающего чтения, который сопровождается предтекстовыми и послетекстовыми заданиями. Блок завершается заданиями на формирование устной профессиональной коммуникации.

Раздел второй «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 третий «Банк текстов профессиональной направленности» представляет собой обширную подборку аутентичных текстов профессиональной тематики. Текстовый банк делится на четыре тематические части: Auto Repair Shop Equipment (3.1), Vehicle Technical Maintenance (3.2), Greatest Innovations and Inventions of Automobile Engineering: From the First Engine to Today (3.3), Latest Technologies, Trends & Innovations in Automotive (3.4).

3.1 Auto Repair Shop Equipment состоит из 7 текстов с иллюстрациями. Содержательный аспект: открытие СТО или авторемонтных мастерских, закупка оборудования для них.

3.2 Vehicle Technical Maintenance состоит из 53 текстов с пошаговыми инструкциями, как диагностировать неисправность и производить ремонт. Часть текстов с иллюстрациями. Содержательный аспект: техническая эксплуатация транспортных средств, техническое обслуживание и текущий ремонт автомобилей, соблюдение правил по технике безопасности.

3.3 Greatest Innovations and Inventions of Automobile Engineering: From the First Engine to Today состоит из 29 текстов небольшого объема. Содержательный аспект: проектирование новой автомобильной техники, механизмов и деталей.

3.4 Latest Technologies, Trends & Innovations in Automotive состоит из 15 текстов небольшого объема. Содержательный аспект: цифровые технологии в автомобильной промышленности, инновации в автомобилестроении, цифровизация транспортной индустрии и логистики, инновационные подходы к организации перевозок и развитию транспортной индустрии.

Раздел четвёртый «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 пятый «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

Book 1

Unit 1. STUDENTS OF AUTOMOTIVE FLEET AND VEHICLE TECHNICAL MAINTENANCE

Exercise 1. Match the Departments and training courses at the Engineering faculty in English (1-16) with their Russian equivalents (a-p).

1. agricultural engineering	a. технология транспортных процессов
2. technosphere safety	b. технические системы в агробизнесе
3. transportation process technology	c. агроинженерия
4. transport-technological machinery and complexes maintenance	d. технический сервис в агропромышленном комплексе
5. technical systems in agribusiness	e. сервис технических систем
6. machinery, storage and processing equipment for agricultural products	f. автомобили и автомобильное хозяйство
7. technical service in agroindustrial complex	g. технические системы и цифровизация производства
8. electrical equipment and technologies	h. технологии и средства механизации в агробизнесе
9. technical systems service	i. автомобильный сервис
10. technical systems and digitization of manufacture	j. эксплуатация транспортно-технологических машин и комплексов
11. IT management in agricultural engineering	k. организация и безопасность движения
12. technologies and mechanized auxiliaries in agribusiness	l. машины и оборудование для хранения и переработки сельскохозяйственной продукции
13. traffic management and safety	m. IT менеджмент в агроинженерии
14. automotive mechanics	n. электрооборудование и электротехнологии
15. automobiles and automotive fleet	o. техническая эксплуатация автомобилей
16. vehicle technical maintenance	p. техносферная безопасность

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

1. automotive fleet автомобильный парк
2. technical maintenance техническая эксплуатация
3. engineering faculty инженерный факультет
4. higher educational establishment высшее учебное заведение
5. highly qualified высококвалифицированный
6. skilled (высоко)квалифицированный, опытный
7. chair кафедра (подразделение учебного заведения)
8. candidate of science кандидат наук
9. doctor of science доктор наук
10. high demand высокий спрос
11. department отделение
13. training course направление подготовки; профессиональное обучение
14. bachelor's degree степень бакалавра

15. training program программа профессиональной подготовки; программа обучения
16. master's degree степень магистра
17. major in специализироваться в какой-либо области; дисциплина, выбранная в качестве специализации
18. first-year student новичок, первокурсник
19. repair восстанавливать; ремонтировать; исправлять; чинить; ремонт; ремонтная работа
20. vehicle транспортное средство; автомобиль
21. fix устранять; ремонтировать; чинить; закреплять, фиксировать
22. service station/ maintenance shop/ repair shop станция технического обслуживания; ремонтная база; ремонтная мастерская
23. car parts автомобильные детали; части автомобиля
24. tool (рабочий) инструмент; оборудование; приспособление; механизм, станок
25. feel чувствовать; ощущать; (интуитивное) ощущение; прощупывать
26. sound звук; звучать; звуковой; шум; звучание
27. smell запах; пахнуть
28. diagnosing диагностирование; обнаружение неисправностей
29. extra class дополнительное занятие
30. knowledge base база знаний
31. instructional video обучающее видео
32. hands-on experience практический опыт
33. higher education высшее образование
34. enter поступать (в учебное заведение)
35. relevant experience соответствующий опыт; профессиональный опыт
36. improve улучшать; совершенствовать
37. practical skills практические навыки
38. valid reason веский довод, веская причина
39. career ladder карьерная лестница
40. succeed in достигать цели, преуспевать; иметь успех
41. basics основы
42. operation работа; эксплуатация
43. maintenance техническое обслуживание и текущий ремонт
44. hands-on activities практические занятия
45. lab лаборатория
46. computerized diagnostics tools компьютерные средства диагностирования (неисправности)
47. automotive industry автомобильная промышленность
48. manufacturing process технология (процесс) изготовления
49. design of new automotive equipment, mechanisms and parts проектирование новой автомобильной техники, механизмов и деталей
50. transport and equipment repair ремонт оборудования и транспорта
51. digital technology цифровые технические средства; цифровые технологии
52. diagnostics of electronic systems диагностирование электронных систем
53. laboratory, field and bench tests лабораторные, полигонные и стендовые испытания
54. sample образец
55. transport technical control технический контроль над транспортом
56. quality control контроль над качеством

57. lubricants and fuel materials горюче-смазочные материалы
58. transport and logistics industry логистика; система поставок
59. equipment оборудование
60. vocational program образовательная программа профессионального обучения
61. hands-on learning практическое обучение, производственная (профессиональная) практика, проведение специальных занятий, выполнение реальных заданий под контролем (руководством) опытных преподавателей с целью как можно более быстрого приобретения навыков, необходимых для будущей работы
62. maintenance technique метод технического обслуживания
63. malfunction diagnostics диагностика неисправностей
64. alternative fuel альтернативное топливо; искусственное топливо; синтетическое топливо
65. hybrid vehicle автомобиль с гибридным приводом; комбинированная транспортная машина
66. transport and maintenance operation management управление перевозками и производством технического обслуживания и ремонта автомобилей
67. safety rules правила по технике безопасности
68. well-rounded всесторонний, всеобъемлющий
69. manual skill квалификация; умение; навык; мастерство
70. have a good command of хорошо владеть чем-либо
71. computer sciences информатика; компьютерные технологии
72. digitization цифровизация, оцифровка
73. machine learning устройство со средствами самообучения, способность устройства увеличивать свою производительность, эффективность или другие аспекты работы на базе предшествующего опыта; компьютерное обучение, машинное обучение (напр. робота)
74. artificial intelligence искусственный интеллект
75. junior младший; первый, второй (курс обучения)
76. attend lectures посещать лекции
77. well-equipped хорошо оборудованный, хорошо оснащённый
78. have at one's disposal иметь в распоряжении
79. master овладевать, усваивать; достичь вершин мастерства
80. foreign literature зарубежная литература
81. information source источник информации
82. scientific and technical achievements научно-технические достижения
83. senior учащийся на старших курсах; выпускной курс
84. special subject профильная дисциплина, спецдисциплина, специальный предмет
85. research work научно-исследовательская работа
86. course paper курсовая работа; курсовик
87. graduation thesis / diploma paper дипломный проект; дипломная работа
88. scientific problem научная проблема
89. practical training производственная практика, стажировка
90. speciality занятие, профессия, специальность, сфера деятельности; специализация
91. academic plan академический план, учебный план
92. enterprise предприятие (фабрика, завод); фирма, компания
93. in practice на практике; практически; на деле
94. defence of the graduation theses защита дипломов

95. State Examining Board государственная экзаменационная комиссия
96. graduate выпускник университета; оканчивать ВУЗ
97. get fixed up in a job устраиваться на работу
98. scientific career научная карьера
99. post-graduate course аспирантура
100. up-to-date technology современная техника, современная технология, новейшая техника, новейшая технология

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

Engineering, faculty, agrarian university, Novosibirsk, Russia, department, interesting, training, courses, agroengineering, program, technical systems, agribusiness, product, technical service, agroindustrial complex, electrical technologies, manufacture, technosphere, transportation process, transport, technological, machine, automobile, traffic, mechanic, student, bike, motorcycle, start, sphere, really, local, type, practical, specialist, plan, business, idea, innovation, automotive industry, manufacturing process, components, basic, modern, transport industry, logistics industry, computer, information technology, optimal, motor, operation, mechanisms, intelligence, role, University diploma.

Exercise 4. Read and translate the text.

Text 1. Students of Engineering Faculty at Novosibirsk Agrarian University

Information sources: <https://www.wikihow.com/Become-an-Auto-Mechanic>,
<https://needlewoman.ru/articles>

I study at the Engineering faculty of Agrarian university in Novosibirsk, Russia. Our University is one of the best higher educational establishments in this segment in our city. The Engineering faculty has trained many highly qualified engineers since the time it was founded. A lot of skilled teachers work at the chairs of our faculty. Most of them are candidates and doctors of science. So, the students get a good education and the graduates from this faculty are in high demand.

At the Engineering faculty there are a lot of Departments that provide numerous interesting training courses. For example, an Agricultural Engineering Department includes such Bachelor's Degree training programs as 'Technical Systems in Agribusiness', 'Machinery, Storage and Processing Equipment for Agricultural Products', 'Technical Service in Agroindustrial Complex', 'Electrical Equipment and Technologies', 'Technical Systems Service', and 'Technical Systems and Digitization of Manufacture' as well as Master's Degree courses of study including 'Technologies and Mechanized Auxiliaries in Agribusiness' and 'IT Management in Agricultural Engineering'. There are also a Technosphere Safety Department, a Transportation Process Technology Department, and a Transport-technological Machinery and Complexes Maintenance Department. The Transportation Process Technology Department trains specialists in the area of 'Traffic Management and Safety'.

I entered the Transport-technological Machinery and Complexes Maintenance Department. This department offers a major in 'Automotive Mechanics', 'Automobiles and Automotive Fleet', and 'Vehicle Technical Maintenance'. I am a first-year student of the Vehicle Technical Maintenance. And my best friend is major in Automobiles and Automotive Fleet at the same faculty.

I like repairing all kinds of 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 service station. He taught me a lot of things, explained the names and uses of different car parts and tools. When a vehicle has a problem, something in the way it feels, sounds, smells or looks is most likely wrong or off. So, I was familiar with these different sounds,

smells, etc. and used them to practice diagnosing. I paid attention to each case in our maintenance shop and tried to guess what could be wrong with each vehicle. Soon, I was very good at diagnosing and I could easily identify and fix most car problems.

While I was at school, I also took an automobile-specific class and extra classes focusing on mathematics and electronics which gave me a strong foundation of knowledge. To widen my knowledge base, I often watch instructional videos on YouTube about making certain repairs in different types of vehicles. Thus, I have some hands-on experience in this sphere and I find dealing with vehicles really exciting.

That's why I decided to get higher education in this field and entered our local uni. I want to gain more relevant experience and knowledge about all types of vehicles and also to improve my practical skills. There is one more valid reason why I need to acquire higher education. The university diploma will make it a lot easier to move up the career ladder and succeed in business.

The vehicle technical maintenance is an introduction to the basics of keeping motor vehicles and automotive facilities in good condition by regularly checking them and repairing them when necessary. We learn the essential principles of automotive operation and maintenance through hands-on labs and classroom activities, focusing on the modern computerized diagnostics tools used by industry.

All specialists in the areas of automotive fleet and vehicle technical maintenance should have an idea of development, trends and innovations in the automotive industry; a car manufacturing process; types of cars; car components; design of new automotive equipment, mechanisms and parts; transport and equipment repairs; the vehicle technical maintenance; digital technologies applied in designing and developing of a new type of equipment and transport; diagnostics of electronic systems; laboratory, field and bench tests using new samples of equipment; transport technical control; quality control of lubricants and fuel materials; transport and logistics industry; equipment needed for a repair shop, etc.

My vocational program includes both lecture-style and hands-on learning. The classes I take cover information about the automotive industry, automotive technology, car components including an internal combustion engine, a chassis, a frame, a clutch, a gearbox, a brake system, a steering system, the electrical equipment fundamentals, as well as maintenance techniques, malfunction diagnostics, alternative fueled and hybrid vehicles, etc. Besides knowledge relating to cars, we have subjects in relevant fields including transport and maintenance operation management, digital technologies in transportation systems and logistics, car shops, dealerships, safety rules, and others. It allows us to get a well-rounded education. As to gaining skills and experience, the course integrates academic study and practical training which gives us the chance to develop our manual skills and become more experienced.

Also, vehicle technical maintenance specialists should have a good command of computer sciences and information technology (IT) because computers offer quick and optimal solutions of different problems related to the automotive industry, motor vehicles and transportation. Besides, digitization, which means turning information into a form that can be read easily by a computer, has influenced all the spheres of our life including work, home and even our cars. Computers are used for better operation of mechanisms in motor vehicles. Digitizing of business processes at automotive industry enterprises is an inevitable change. Both machine learning and artificial intelligence play a significant role in digitizing transport processes and logistics.

The junior students are taught mathematics, physics, a foreign language (English or German), chemistry, philosophy, computer processing of information, etc. We attend lectures, do laboratory work and tests. We have quite a number of well-equipped laboratories

at our disposal. Mastering English enables us to read foreign literature, the information sources in English on the web and learn about the latest scientific and technical achievements worldwide.

The senior students study special subjects. The fourth-year students combine their studies with their research work. They write course papers and graduation theses on the scientific problems of their research work. Also, the students of the Engineering faculty have their practical training in order to have a clear idea of their speciality. According to the academic plan the seniors are sent to work at different transport enterprises such as service stations, dealerships, maintenance shops, etc., where they learn to employ in practice the knowledge they gain at the University. During practical training the students master the job of a vehicle technical maintenance specialist and at the same time collect materials for their diploma papers. The final and most important period in the students' life is the defence of the graduation theses in the presence of the State Examining Board.

The graduates get work according to their speciality. They may work as car mechanics, transport engineers, automotive service technicians, car technical condition inspectors or vehicle diagnostics specialists. They usually get fixed up in a job at transport enterprises, car service stations, dealerships, transportation network companies, marketing departments and transport and forwarding services. Besides, they are provided with everything necessary for a scientific career entering a post-graduate course. In a word, they have a wide range of job opportunities.

When I graduate from the university, I will be a vehicle technical maintenance specialist. I will deal with technical maintenance of different types of motor vehicles (cars or trucks) in the automotive fleets. I am planning to expand our family business. I'm particularly interested in everything connected with the innovations and up-to-date technologies in the area of automobiles' production and maintenance.

Exercise 5. Match the car components and systems in English (1-8) with their Russian equivalents (a-h).

1. internal combustion engine	a. каркас; рама
2. chassis	b. сцепление
3. frame	c. двигатель внутреннего сгорания
4. brake system	d. система рулевого управления
5. clutch	e. электрооборудование
6. gearbox	f. тормозная система
7. steering system	g. ходовая часть; шасси
8. electrical equipment	h. коробка передач

Exercise 6. Match the jobs and places of employment in English (1-11) with their Russian equivalents (a-k).

1. car mechanic	a. слесарь по ремонту автомобилей
2. transport engineer	b. транспортное предприятие
3. car technical condition inspector	c. специалист по диагностике транспортных средств
4. vehicle diagnostics specialist	d. автосервис; станция технического обслуживания автомобилей
5. automotive service technician	e. транспортный инженер; инженер по эксплуатации автомобилей; специалист по эксплуатации транспортных средств
6. transport enterprise	f. информационно-диспетчерская служба

7. car service station	g. отдел маркетинга; отдел сбыта
8. dealership	h. автомеханик
9. marketing department	i. транспортно-экспедиционное обслуживание
10. transportation network company	j. контролёр технического состояния автомобилей
11. transport and forwarding service	k. дилерский центр; местное представительство, агентство (фирмы)

Exercise 7. Answer the questions about Text 1.

1. What faculty do you study at?
2. What departments are there at the Engineering Faculty of the Novosibirsk Agrarian University?
3. What training courses can students choose at the Engineering Faculty?
4. What training programs does the Transport-technological Machines and Complexes Maintenance Department offer?
5. What are you major in?
6. Why did you decide to enter the Engineering Faculty?
7. What were you good at when helped your Dad at your family service station?
8. What do you do to widen your knowledge base?
9. What is the vehicle technical maintenance?
10. What should specialists dealing with automobiles, the automotive fleet and vehicle technical maintenance know?
11. What does your vocational program include?
12. How do you gain manual skills and experience?
13. Why should vehicle technical maintenance specialists have a good command of computer sciences and IT?
11. What is a role of computers in cars?
12. What is a digitization?
13. What areas can a digitizing be applied in?
14. What subjects do the junior students have?
15. Why is it important to master English?
16. What disciplines do the senior students study?
17. Where do the seniors have their practical training?
18. What is the final period in the students' life?
19. What jobs can graduates apply for?
20. Where can they work?
21. What kind of specialist will you become after graduating from the university?
22. What are you plans for your future career?

Exercise 8. Choose the appropriate ending to the sentences (1-5).

1. The Transport-technological Machinery and Complexes Maintenance Department offers a major in ...
 - a. 'Traffic Management and Safety'.
 - b. 'IT Management in Agricultural Engineering'.
 - c. 'Automotive Mechanics', 'Automobiles and Automotive Fleet', and 'Vehicle Technical Maintenance'.
2. All specialists in the areas of automotive fleet and vehicle technical maintenance should be good at ...
 - a. design of new automotive equipment, mechanisms and parts; transport and

equipment diagnostics and repairs; digital technologies; laboratory, field and bench tests; transport technical control; etc.

b. technosphere safety.

c. machinery, storage and processing equipment for agricultural products.

3. The junior students are taught...

a. to collect materials for their diploma papers.

b. mathematics, physics, a foreign language, chemistry, philosophy, computer processing of information, etc.

c. special subjects.

4. The senior students...

a. study special subjects, write course papers and graduation theses on their research work and have their practical training, get ready for the defence of the graduation theses in the presence of the State Examining Board.

b. study basic disciplines to revise the school program.

c. take a post-graduate course.

5. The graduates of the Automobiles and Automotive Fleet and Vehicle Technical Maintenance may work as...

a. car mechanics, transport engineers, automotive service technicians, car technical condition inspectors or vehicle diagnostics specialists.

b. designers, and office managers.

c. IT specialists.

Exercise 9. Work in pairs. Read and translate a dialogue between two students.

Act it out.

Student 1: Where do you study?

Student 2: I study at the Engineering Faculty at University in Novosibirsk.

S. 1: What are you major in?

S. 2: I'm specializing in a vehicle technical maintenance. After graduating from the university, I will be a transport engineer. I mean a vehicle technical maintenance and diagnostics specialist.

S. 1: Sounds cool! Why did you decide to choose this job?

S. 2: Well, I enjoy dealing with all kinds of machines, bikes, motorcycles and cars. I like learning about automobile systems, motor vehicles service techniques, malfunction diagnostics, and repairs. Besides automobiles, we study a lot of interesting subjects in relevant fields.

S. 1: Really? Tell me about them.

S. 2: Well, they are about automotive service management, digital technologies in transportation systems and logistics, car shops, dealerships, the rules of safety techniques, and others.

S. 1: Do you enjoy the course?

S. 2: Yes, I do. Very much. I have learned a lot of things already. Besides, we have practical training. It helps to develop our manual skills and get some experience for our future job.

S. 1: What jobs can you apply for after graduation?

S. 2: Well, I may work as a car mechanic, transport engineer, automotive service technician, car technical condition inspector or vehicle diagnostics specialist.

S. 1: Good. So, you are open to opportunities! And what are the places of employment, then?

S. 2: Hmm... There are a lot of them. From transport enterprises, car service sta-

tions, dealerships, transportation network companies to marketing departments and transport and forwarding services.

S. 1: Sounds promising! I think you will become an excellent expert in transport engineering.

S. 2: I'll do my best. The integration of academic study with practical training at transport enterprises will help me to become a highly qualified specialist.

Exercise 10. Complete the sentences (1-7) with the words and word combinations given in the box.

A transport engineer, the Vehicle Technical Maintenance, keeping vehicles and automotive facilities in good condition, student, the Engineering faculty, and hands-on learning, enterprises

1. I study at...
2. I am a first-year...
3. I am major in
4. The vehicle technical maintenance is an introduction to the basics of...
5. My vocational program includes both lecture-style...
6. After graduating from the university I will work as...
7. I hope to get a job at one of the leading transport...

Exercise 11. Answer the questions about yourself.

1. What university do you study at?
2. What faculty did you enter?
3. What are you major in?
4. Why did you decide to enter the Engineering Faculty?
5. What does your vocational program include?
6. What subjects do the junior students have?
7. What disciplines do the senior students study?
8. Where do the seniors have their practical training?
9. Do the seniors defend their graduation theses in the presence of the State Examining Board?
10. What kind of specialist will you become after graduating from the university?
11. What job are you going to apply for?
12. Where do you want to work?

Exercise 12. 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. DEVELOPMENT OF AUTOMOTIVE INDUSTRY

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

1. automotive industry автомобильная промышленность
2. motor vehicles автомобиль
3. engine двигатель; мотор
4. body корпус; кузов
5. tire покрышка; шина
6. battery аккумулятор; (аккумуляторная) батарея
7. fuel топливо; горючее

8. light truck грузовой автомобиль малой грузоподъёмности; лёгкий грузовой автомобиль
9. pickup пикап (грузовой автомобиль на шасси легкового автомобиля)
10. van автомобиль-фургон, (авто)фургон
11. sport utility vehicle (SUV) внедорожник
12. commercial vehicle коммерческое транспортное средство; автомобиль для коммерческих перевозок
13. delivery truck грузовик для доставки продуктов на дом; доставочный автомобиль; автофургон для развозки товаров
14. large transport truck (semi) большой грузовой автомобиль (фура)
15. steam-powered road vehicle автомобиль на паровой тяге
16. gasoline engine бензиновый двигатель
17. development развитие, расширение, рост; эволюция
18. handmade car ручной работы, сделанный/собранный вручную
19. abandon отказываться; оставлять; бросать; прекращать
20. survive выдержать, продолжать существовать; сохраняться
21. large-scale production крупное производство, массовое производство
22. horse-drawn vehicle автомобиль на конной тяге
23. machinery manufacturer производитель машинного/станочного оборудования, техники или механизмов
24. stationary gas engines стационарный газовый двигатель
25. marine engine судовой двигатель
26. sheep-shearing machinery оборудование для стрижки овец
27. sewing machine швейная машина
28. woodworking machine станки для деревообработки
29. milling machinery фрезеровочный станок
30. birdcage клетка (для птиц)
31. plumbing fixture сантехника
32. enameled cast-iron bathtub эмалированная ванна из чугуна
33. carmaker производитель автомобилей
34. business skill деловые навыки
35. assembler сборщик; предприятие, которое занимается сборкой
36. self-sufficient самостоятельный, самообеспеченный; автономный; независимый; самокупающийся
37. electric automobile электрический автомобиль; электромобиль
38. quiet тихий, бесшумный
39. easy to operate легко управлять
40. battery capacity ёмкость аккумуляторной батареи
41. fatal noncompetitiveness неизбежную неконкурентоспособность
42. limited production ограниченное/мелкосерийное производство
43. steam power энергия пара; давление пара; паровая тяга
44. rival достойный соперник; конкурент
45. steam car паровой автомобиль
46. elaborate тщательно, детально разработанный; продуманный; законченный; улучшенный, усовершенствованный
47. transmission коробка передач; передача; привод; трансмиссия
48. maintain обслуживать; поддерживать в работоспособном состоянии
49. living standards жизненный уровень, уровень жизни
50. purchasing power покупательная способность, платёжеспособность

51. tax налог, пошлина, сбор
52. productive capacity производительность, производственная мощность
53. military value польза для вооруженных сил
54. transport and supply транспортировка и поставка снабжения
55. automotive plant завод по производству автомобилей
56. converted переделанный; переоборудованный, реконструированный
57. military equipment военная техника
58. aircraft самолёт, воздушное судно
59. striking expansion значительный рост
60. output объём
61. -fold -кратный; -кратно
62. regain восстанавливать; возвращать (утраченное)
63. overseas за границей
64. leading ведущий, главный; лидирующий; основной
65. merge сливаться, соединяться
66. technological advance технологическая новизна; технический прогресс
67. full-scale полномасштабный
68. precision точность; чёткость, аккуратность; правильность
69. interchangeability взаимозаменяемость, заменимость
70. continuity непрерывность; преемственность; целостность
71. body корпус; кузов
72. mudguard крыло
73. incorporate объединять; присоединять; становиться частью целого
74. flowing lines мягкие линии; плавные линии
75. technical features технические характеристики
76. V8 engine восьмицилиндровый поршневой двигатель с V-образным расположением цилиндров
77. three-point engine suspension трёхточечная подвеска двигателя
78. freewheeling езда накатом; вращение по инерции; муфта свободного хода
79. overdrive повышающая передача; ускоряющая передача
80. automatic transmission автоматическая коробка передач; автоматическая трансмиссия

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

Term, automotive industry, company, manufacture, motor, component, industry's principal products, passenger automobiles, pickup, van, sport, commercial, transport, produce, principal, mass production technique, France, Germany, British, Italian, business, era, characteristic, category, Europe, Opel, Morris, Britain, Studebaker, machine, stationary, gas, American company, Pierce, Buick, Rolls-Royce, Ford, partners, talent, producer, minimal investment, capital, credit, European automotive firms, period, pioneer automobile manufacturer, technical and financial problems, basic, experimentation, electricity, electric automobile, limitations, fatality, popular, limited production, Detroit, regular basis, serious, transmission, demonstrate, transport, convert, tanks, percent, individual, leader, producer, recession, economic, dominate, European industry, American industry, progress, standard, national, tariff policy, standardization, synchronization, innovation, experimentation, role, American system of manufacture, fundamental techniques, mechanism, depression, domination, economically, style, passenger, design, bumper, limited, automatic transmission, interesting.

Exercise 3. Read and translate Text 1.

Text 1. History of Automotive Industry in Brief

Source: <https://www.britannica.com/technology/automotive-industry>

The term 'an automotive industry' means all those companies and activities involved in the manufacture of motor vehicles, including most components, such as engines and bodies, but excluding tires, batteries, and fuel. The industry's principal products are passenger automobiles and light trucks, including pickups, vans, and sport utility vehicles. Commercial vehicles (i.e., delivery trucks and large transport trucks), though important to the industry, are secondary.

Although steam-powered road vehicles were produced earlier, the origins of the automotive industry are rooted in the development of the gasoline engine in the 1860s and '70s, principally in France and Germany. By the beginning of the 20th century, German and French manufacturers had been joined by British, Italian and American makers.

As to developments before the First World War, most early automobile companies were small shops. There were hundreds of them. They produced a few handmade cars, and nearly all of which abandoned the business soon after going into it. The ones that survived into the era of a large-scale production had certain characteristics in common. First, they fell into one of three well-defined categories: they were makers of bicycles, such as Opel in Germany and Morris in Great Britain; builders of horse-drawn vehicles, such as Durant and Studebaker in the United States; or, most frequently, machinery manufacturers. The kinds of machinery included stationary gas engines (Daimler of Germany, Lanchester of Britain, Olds of the USA), marine engines (Vauxhall of Britain), machine tools (Leland of the USA), sheep-shearing machinery (Wolseley of Britain), washing machines (Peerless of the USA), sewing machines (White of the USA), and woodworking and milling machinery (Panhard and Levassor of France). One American company, Pierce, made birdcages, and another, Buick, made plumbing fixtures, including the first enameled cast-iron bathtub. Two notable exceptions to the general pattern were Rolls-Royce in Britain and Ford in the USA, both of which were founded as carmakers by partners who combined engineering talent and business skill.

Although the automobile originated in Europe in the late 19th century, the USA completely dominated the world industry for the first half of the 20th century through the invention of mass production techniques.

In the USA almost all of the producers were assemblers who put together components and parts that were manufactured by separate firms. It was possible to begin building motor vehicles with a minimal investment of capital by buying parts on credit and selling the finished cars for cash. European automotive firms of this period tended to be more self-sufficient.

The pioneer automobile manufacturer not only had to solve the technical and financial problems of getting into production but also had to make a basic decision about what to produce. After the first success of the gasoline engine, there was widespread experimentation with steam and electricity. For a brief period, the electric automobile actually enjoyed the greatest acceptance because it was quiet and easy to operate, but the limitations imposed by a battery capacity proved its fatal noncompetitiveness. Especially popular with women, electric cars remained in limited production well into the 1920s. One of the longest-surviving makers, Detroit Electric Car Company, operated on a regular basis through 1929.

Steam power was a more serious rival after 1900. The steam car was easy to operate because it did not require an elaborate transmission. But the suitable engines for them were expensive to produce and difficult to maintain. By 1910 most manufacturers of steam vehicles had turned to gasoline power. The Stanley brothers in the USA, however, continued to manufacture steam automobiles until the early 1920s.

The period from 1919 to 1939 also brought significant growth in automobile manufacturing in Europe, though on a considerably smaller scale than in the United States. The European industry was moving in the same directions as the American industry, toward a mass market for motor vehicles, but it made slower progress for a variety of reasons: lower living standards with less purchasing power, smaller national markets, and more restrictions in tax and tariff policies.

The productive capacity of the automotive industry during the Second World War first demonstrated its military value. Motor vehicles were used extensively for transport and supply. In addition, automotive plants could readily be converted into facilities for manufacturing military equipment, including tanks and aircraft.

After the Second World War there was a striking expansion of motor vehicle production. During a 35-year period the total world output increased almost 10-fold. The most significant feature of this increase was that most of it occurred outside the USA. Although American production continued to grow, its share of the world automotive production fell from about 80 percent of the total to 20 percent. Among individual countries the USA was the leading producer until the recession of the early 1980s. In 1980 Japan, which had had little automotive manufacturing before the war, became the leading producer, with the European Economic Community ranking second. The USA regained the lead in vehicle production in 1994, since by that time Japanese manufacturers were building more of their products in factories in their major overseas markets, such as the USA. However, in the early 21st century, China became the leading manufacturer of cars.

Exercise 4. Answer the questions.

1. What does the 'automotive industry' mean?
2. What are the automotive industry's principal products?
3. When and where was the gasoline engine developed?
4. Which car makers had been joined German and French manufacturers by the beginning of the 20th century?
5. What were automobile companies before the First World War look like?
6. What are the categories of automobile companies that survived into the era of a large-scale production?
7. What machinery manufacturers became large-scale car manufacturers?
8. Which two companies were founded as carmakers?
9. Why did the USA completely dominate the world industry for the first half of the 20th century?
10. Why did almost all of the motor vehicle producers preferred to be assemblers in the USA?
11. What problems did the pioneer automobile manufacturer have to solve?
12. Why was the electric automobile popular?
13. Why did the electric automobile prove fatal noncompetitiveness?
14. What were the advantages and disadvantages of steam cars?
15. What type of vehicles did most manufacturers start to produce after steam vehicles?
16. Why did the European industry make slower progress than the American industry from 1919 to 1939?
17. What happened to the automotive industry during the Second World War?
18. What was the situation like after the Second World War?
19. How did the automotive industry develop in the USA, Japan, European countries and China?

Exercise 5. Match the terms (1-8) with their definitions (a-h).

1. motor vehicle	a. a small van or truck with low sides
2. sport utility vehicle	b. a covered motor vehicle, typically without side windows, used for transporting goods or people
3. pickup	c. a vehicle used for carrying goods or fare-paying passengers
4. van	d. a road vehicle powered by an internal-combustion engine
5. commercial vehicle	e. a powerful vehicle with four-wheel drive that can be driven over rough ground; the abbreviation SUV is often used
6. handmade	f. power that is applied to an engine by the force of steam
7. steam power	g. a vehicle that is pulled by one or more horses
8. horse-drawn vehicle	h. made by hand, not by machine, and typically therefore of superior quality

Exercise 6. Read about the development of the automotive industry in different countries after the Second World War. Match the countries (1-7) with the descriptions (a-g).

Information source: <https://www.britannica.com/technology/automotive-industry>

1. Great Britain	a
2. France	b
3. Italy	c
4. Germany	d
5. Japan	e
6. South Korea	f
7. Sweden	g

a. Fiat (Fabbrica Italiana Automobili Torino), a firm founded in 1899 but without a mass market until the 1950s, dominated the country's automotive production. Automobile manufacturers from this country gained a reputation for highly engineered sports cars and racing cars, but the country had no mass market and, therefore, achieved only small-scale production at that time.

b. The automotive industry of this country has a significant place in the world market. Three major companies – Hyundai Motor Company, Kia Motors Corporation, and Daewoo Motor Corporation – accounted for about 90 percent of the country's market, while the remainder was split among two minor producers and imports. Hyundai, the country's dominant automaker, produced cars, light trucks, commercial trucks and buses. Kia, the second largest automaker, was acquired by Hyundai in 1999. Daewoo, owned by the Daewoo Group conglomerate, entered the automobile field on a large scale in the 1980s and had won nearly a fifth of the market. It was reorganized in 2000. Two years later it was sold to General Motors.

c. Saab and Volvo became important factors in the world market during the 1960s and '70s. Their car operations were acquired in the 1980s and '90s by General Motors and Ford, respectively. However, both Saab and Volvo were sold in 2010, and the former went bankrupt the following year.

d. In 1952 Morris and Austin merged to form the British Motor Corporation, Ltd. Another British syndicate was formed around Leyland Motors. Leyland and the British Motor Corporation united in 1968 as the British Leyland Motor Corporation (after 1978, BL Ltd.). The automobile output was then largely controlled by four firms: British Leyland, Ford, Vauxhall, and Rootes. One part of BL was sold off to France's Peugeot-Citroën in 1978. In the 1980s the remaining parts of BL, building Jaguar, Mini, Rover cars, Land Rover SUVs and commercial trucks, became the Rover Group. Then, it was ac-

quired by British Aerospace Corporation. Rover then entered into a cooperative venture with Japan's Honda to produce cars of Honda design at Rover plants for sale in Britain and other European countries. Eventually Honda became dissatisfied with the venture, and British Aerospace sold the Rover/Mini operations to German BMW in 1994. In 2000 BMW sold the Land Rover segment to Ford, which had acquired the stock of Jaguar in 1989. In 2008 Ford sold Jaguar and Land Rover to the Tata Group of India. Vauxhall was first sold to General Motors and later, in 2017, to the French PSA Group.

e. The automotive industry of this country was centred on Renault, Peugeot, Citroën, and Simca. Renault became a public corporation in the 1990s. Citroën was acquired in 1976 by independently owned Peugeot to form PSA Peugeot-Citroën (later PSA Group). Simca became a Chrysler property in 1958 but was sold to Peugeot in the late 1970s.

f. The most spectacular increases in the automotive production after World War II occurred in this country. During the late 1970s and early '80s, its principal automakers – Toyota, Nissan, Honda, and Tōyō Kōgyō (later Mazda) – were the key exporters in North American and Western European markets. These companies as well as Mitsubishi, Isuzu, Fuji, and Suzuki later opened manufacturing plants in major markets overseas. In the 1990s the economy suffered a severe and prolonged recession. At the end of the 20th century, many automakers and several major component manufacturers were controlled by non-Japanese firms. Renault, for example, held a controlling interest in Nissan, and in 2016 Mitsubishi joined the Renault-Nissan alliance.

g. At the end of the Second World War the Volkswagen factory was in ruins. Restored to production, the plant established a strong position in the world market. Volkswagen acquired Auto Union, which evolved into its Audi luxury car segment. In the late 1960s BMW rose from a builder of small, oddly styled Isetta cars and motorcycles into a producer of high-priced passenger vehicles and premium motorcycles. Opel became the base for the European operations of General Motors, but it was sold to the PSA Group in 2017.

Exercise 7. Read about the introduction of full-scale mass production in the automotive industry. Complete the sentences with the words given in the box.

Information source: <https://www.britannica.com/technology/automotive-industry>

Production, applied, technique, popular, automotive

1. The outstanding contribution of the ... industry to technological advance was the introduction of a full-scale mass production, a process combining precision, standardization, interchangeability, synchronization, and continuity. 2. Mass ... was an American innovation. 3. The USA, with its large population, high standard of living, and long distances, was the natural birthplace of the ..., which had been partly explored in the 19th century. 4. Although Europe had shared in the experimentation, the American role was emphasized in the ... description of standardization and interchangeability as 'the American system of manufacture'. 5. The fundamental techniques were known, but they had not previously been ... to the manufacture of a mechanism as complex as a motor vehicle.

Exercise 8. Work in pairs. Read and translate a dialogue between two students. Act it out.

Information source: <https://www.britannica.com/technology/automotive-industry>

Student 1: We've read a text about the history of the automotive industry. Have you known that by 1929 the Big Three supplied three-fourths of the American market for motor vehicles?

Student 2: The Big Three? What do you mean?

S. 1: Well, that stands for Ford, General Motors and Chrysler.

S. 2: Ah, now I see. Yeah, you are right! They dominated the market. But there were also five largest independents. I mean Hudson, Nash, Packard, Studebaker, and Willys-Overland. They shared the rest of the market. Unfortunately, the depression years of the 1930s eliminated almost all the largest independent manufacturers.

S. 1: But also, it increased further domination of the Big Three. It's interesting that despite those years were difficult economically; there were some significant developments within the industry.

S. 2: Really? Which ones?

S. 1: Well, there were changes in the style of a passenger-car design. The body, bumpers, and mudguards were incorporated into a single pattern of smoothly flowing lines.

S. 2: Okay. And what about technical features?

S. 1: A lot of them came into general use. The V8 engine was introduced by Ford in 1932; three-point engine suspension; freewheeling; overdrive, you know, a fourth forward speed; and, on a limited scale, automatic transmission

S. 2: Sounds interesting! I can't believe that the automatic transmission was invented so many years ago.

Exercise 9. Search the Web for more information about the history of the automotive industry in different countries, including Russia, and make a presentation about it.

Exercise 10. 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. MODERN AUTOMOTIVE INDUSTRY

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

1. output выпуск изделий; производство, производственный процесс
2. equipment оборудование; оснащение; материальная часть; аппаратура; техника; приборы; устройства
3. tooling технологическая оснастка; инструменты, оснащение, оборудование (инструментами, приборами)
4. assembly plant сборочный завод
5. yield the manufacture передавать право на производство
6. noncritical не основной; второстепенный
7. component компонент; элемент; деталь; составная часть; узел
8. seat сиденье
9. wheel assembly колесо в сборе
10. facilities производственные мощности, предприятия
11. contemplate рассматривать; предполагать; намереваться; замышлять
12. market survey изучение рынка, обзор состояния рынка
13. executive руководитель, управляющий; руководство
14. mock-up экспериментальная модель, макет в масштабе 1:1
15. revision исправление, доработка, изменение, модификация
16. refinement улучшение; доводка (конструкции); усовершенствование; модернизация; отладка; настройка
17. engineering инженерия; конструирование; разработка
18. launch запуск; выпуск новых товаров на рынок
19. reengineering реинжиниринг; реорганизация бизнес-процессов; перестройка фирмы; перепроектирование; переконструирование

20. assembly line сборочный конвейер; линия сборки
21. elaborated детально разработанный; продуманный; улучшенный
22. requisite необходимый элемент; реквизит
23. stockpile накапливать, делать запасы; создавать резерв
24. subsidiary дочерняя компания, филиал
25. tire покрышка; шина
26. battery батарея; аккумулятор
27. dashboard instruments комплектующие приборной панели
28. procure приобретать; закупать; снабжать, поставлять
29. outside supplier поставщик со стороны; внешний поставщик
30. in-house внутренний; собственного производства, собственной разработки; выполняемый собственными силами организации
31. capability возможность; мощность; производительность
32. highly specialized tools узкоспециализированное оборудование
33. stamping press штамповочный пресс
34. body panel панель кузова
35. run партия товара, количество произведенных единиц товара
36. assembly process технология сборочного процесса
37. automatic control system система автоматического управления
38. transfer machine агрегатный станок, поточная линия
39. computer-guided welding robots управляемый компьютером сварочный робот
40. automated equipment автоматическое оборудование
41. manual operation ручная операция; работа вручную
42. assembly operation сборка
43. wheel patterns модели колёс
44. mass consumption массовое потребление
45. restricted franchise dealership дилерский центр, работающий по франшизе
46. uniform method стандартизированный метод; единый метод
47. make изделие; марка; модель
48. sales territory сбытовая территория
49. servicing facilities средства и оборудование для технического обслуживания
50. direct selling продажа без посредника; прямые розничные продажи
51. strong resistance решительное сопротивление; сильное сопротивление
52. e-market электронный рынок
53. in its infancy на этапе становления
54. used car подержанный автомобиль
55. distribution system система распространения (изделий)
56. motor vehicle industry автомобильная промышленность; автомобилестроение
57. predecessors предшественник
58. resale перепродажа
59. wear out изнашиваться, истираться
60. scrap metal скрап, железный лом, металлолом
61. steel furnace сталеплавильная печь
62. wrecking yard место для старых автомобилей; авторазборка
63. usable part пригодная к использованию деталь
64. salvage использовать подержанную деталь; утилизировать
65. discarded ненужный; выброшенный; использованный
66. disfigure обезображивать, уродовать; портить
67. wreck остатки; обломки (автомобиля и т. п.)

68. automobile graveyard свалка автомобилей; автомобильное кладбище
69. recycling переработка отходов (для повторного использования)
70. bumper cover накладка бампера; крышка бампера
71. fender liner брызговик
72. battery tray поддон аккумуляторной батареи; полка для аккумуляторной батареи
73. chassis ходовая часть; шасси; рама
74. body panel панель кузова
75. upholstery обивка; обивочный материал
76. hardware комплектующее оборудование
77. wiring проводка
78. spring пружина; рессора
79. steering gear рулевой механизм
80. power train силовая передача, трансмиссия
81. drive shaft ведущий вал
82. transmission коробка передач
83. brake тормозной механизм; тормоз
84. exhaust system система выпуска отработавших газов
85. unitized унифицированный; собранный из агрегатных сборочных единиц или узлов; агрегатированный
86. undercarriage несущая система автомобиля; ходовая часть
87. front suspension подвеска передних колёс; передняя подвеска
88. rear axle задняя ось; задний мост
89. favorable effect благоприятный эффект
90. through traffic сквозное движение; транзитные перевозки
91. local traffic местное сообщение; движение в пределах одной транспортной линии
92. highway автомагистраль; автострада; шоссе
93. paved road дорога с покрытием; мощёная дорога
94. trade balance торговый баланс
95. drive-in and drive-through кинотеатр для автомобилистов; ресторан, магазин или банк, обслуживающий клиентов непосредственно в автомобиле
96. credit purchase покупка в кредит
97. petroleum refining переработка нефти, нефтепереработка
98. steelmaking сталеварение, производство стали
99. plate glass зеркальное стекло
100. freight грузовые перевозки
101. recreational travelling автотуризм
102. durable consumer goods потребительские товары длительного пользования (мебель, бытовая техника и т.п.)
103. adverse effect неблагоприятный эффект
104. unforeseen and undesirable consequences непредвиденные и нежелательные последствия
105. traffic jams пробки на дорогах
106. air pollution загрязнение воздуха
107. highway accident несчастный случай на автомобильной дороге
108. horrendous жуткий
109. bypass highway объездная шоссейная дорога
110. public transit system система общественного транспорта

111. suburban bus пригородный автобус
112. commuter electric train пригородный электропоезд
113. carbon dioxide emission выброс углекислого газа в атмосферу
114. fuel cell топливный элемент
115. hydrogen and oxygen водород и кислород
116. policy maker высшее должностное лицо, высокопоставленный политик
117. fatality несчастный случай с летальным исходом
118. speed limit предел скорости; ограничение скорости движения
119. safety features меры обеспечения безопасности
120. seat belt ремень безопасности
121. air bag воздушная подушка безопасности
122. controversial спорный, сомнительный; дискуссионный
123. global positioning satellite спутник глобальной навигационной системы; спутник глобальной системы определения местоположения
124. onboard digital road map встроенная цифровая дорожная карта
125. fuel supply подача топлива

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

Modern automotive industry, consolidation, motor, firm, fundamental, mass production, investment, central organization, committee, policy, planning, semiautonomous, management, regional, alternative, manufacture, component, group, standardized, model, interval, dealers, element, risk, conferences, engineers, stylists, basic design, international nature, conception, designers, marketing managers, engineering, design process, reengineering, Ford, requisite, accurately controlled, materials, company, stop, integration, battery, instrument, economical, special, operation, specialized, invest, press, panel, automatic control systems, transfer, machine, computer, robot, automated, universal form, style, programmed, combinations, adequate service, dealer, objective, technique, franchise, method, quota, guarantee, territory, financing, contract, standard, traditional, Internet, resistance, limited, radically, potential, metal, problem, situation, product, material, bumper, battery, chassis, panel, interior, transmission, differential, plus, finished, testing, inspection, variation, construction, line, pedestal, structure, commercial, programmed.

Exercise 3. Read and translate Text 1.

Text 1. The Modern Automotive Industry

Source: <https://www.britannica.com/technology/automotive-industry>

The modern automotive industry is huge. Thanks to the trend toward consolidation, in major producing country the output of motor vehicles is in the hands of a few very large firms, and small independent producers have virtually disappeared. The fundamental cause of this trend is mass production, which requires a heavy investment in equipment and tooling and is, therefore, feasible only for a large organization.

There is usually a central organization with an executive committee responsible for overall policy and planning. The operating divisions are semiautonomous, each reporting directly to the central authority but responsible for its own internal management. There are also some regional assembly plants. As an alternative, some automakers yield the manufacture of noncritical components, e.g., seats and wheel assemblies, to independent suppliers to make the pieces at small facilities close to the assembly plants. The components are often assembled into larger groups of parts and sent to the assembly plant in the exact sequence and at the exact time needed.

The process of putting a new car on the market is standardized. If a completely new model is contemplated, the first step is a market survey. Since there may be an interval of

five years between this survey and the appearance of the new car in the dealers' showrooms, there is a distinct element of risk. Conferences then follow for engineers, stylists, and executives to agree on the basic design. The next stage is a mock-up of the car, on which revisions and refinements can be worked out. Because of the increasingly competitive and international nature of the industry, manufacturers employ various means to shorten the time from conception to production to less than three years. This can be done by incorporating vehicle engineers, designers, manufacturing engineers, and marketing managers into a single team responsible for the design, engineering, and marketing launch of the new model. Automakers also involve component manufacturers in the design process to eliminate costly time-consuming reengineering later. Often the component maker is given full responsibility for the design and engineering of a part as well as for its manufacture.

Most of the world's new cars come from the moving assembly line introduced by Ford, but the process is much more refined and elaborated today. The first requisite of this process is an accurately controlled flow of materials into the assembly plants. On the one hand, no company can afford either the money or the space to stockpile the parts and components needed for any extended period of production. On the other hand, interruption in the flow of materials quickly stops production. So, the need for careful control over the flow of materials is an incentive for automobile firms to manufacture their own components, sometimes directly but more often through subsidiaries. Yet, complete integration does not exist. Tires, batteries, and dashboard instruments are generally procured from outside sources. The largest companies support outside suppliers for items of in-house manufacture. First, it may be more economical to buy externally than to provide additional internal facilities for the purpose. Second, the supplier firm may have special equipment and capability. Third, the outside supplier provides a check on the costs of the in-house operation.

Production of a new model also calls for elaborate tooling, and the larger the output, the more highly specialized the tools in which the manufacturer is willing to invest. For example, it is expensive to install a stamping press exclusively to make a single body panel for a single model, but, if the model run reaches several hundred thousand, the cost is amply justified.

The assembly process itself has a quite uniform pattern throughout the world. Modern assembly lines have automatic control systems, transfer machines, computer-guided welding robots, and other automated equipment, which replaced many manual operations when volume is high. A universal form of automatic control uses computers to schedule assembly operations so that a variety of styles can be programmed along the same assembly line. Customers can be offered wide choices in body styles, wheel patterns, and colour combinations.

As to sales and service organization, mass production implies mass consumption, which, in turn, requires an elaborate distributive organization to sell the cars and to develop confidence among customers that adequate service will be available. In the early days of the industry, cars were sold directly from the factory or through independent dealers. When sales in large quantities became the objective, however, more elaborate and better organized techniques of distribution became essential.

In some countries the restricted franchise dealership became the uniform method of selling new cars. In this system, dealers may sell only the particular make of new car specified in their franchise, must accept a quota of cars specified by the manufacturer, and must pay cash on delivery. In return the dealers receive some guarantee of sales territory and may be assisted in various ways by the manufacturer – financing or aid in advertising, for example. Contracts also specify that dealers must maintain service facilities according to standards approved by the manufacturer. Attempts by automakers in the 1990s to move

away from the traditional franchised dealer network to direct selling via the Internet met strong resistance from the dealers in some countries, so manufacturers could sell only limited quantities. Even now the e-market for new brand cars is in its infancy. In December 2020 Hyundai launched online sales.

The market in used cars is an important part of the distribution system for motor vehicles in all countries with a substantial motor vehicle industry because it affects the sale and styling of new cars. The new model must have enough changes in styling or engineering to persuade prospective buyers that it is indeed an improvement. At the same time, it must not be so radically different from its predecessors as to give the buyer doubts about its resale potential.

Like all machinery, motor vehicles wear out. Some become scrap metal to feed steel furnaces; some go to wrecking yards where usable parts are salvaged. Throughout the world, however, the disposal of discarded motor vehicles has become a problem without a completely satisfactory solution. In many areas, landscapes are disfigured by abandoned wrecks or unsightly automobile graveyards. To change the situation for the better, manufacturers worldwide began engineering new products with the complete recycling of components in mind. At the same time, they use more and different recycled material in new vehicles. For example, old bumper covers are recycled into fender liners or battery trays for new cars.

Exercise 4. Answer the questions.

1. What is the modern automotive industry like?
2. What is a typical structure of a large car manufacturing firm?
3. What is the role of independent suppliers?
4. What are the stages of a new car market entry procedure?
5. How is it possible to shorten the interval from conception to production?
6. Why do automakers involve component manufacturers in the design process?
7. Who introduced the first moving assembly line?
8. Why is it essential to control the flow of materials into the assembly plants?
9. Why do the largest companies support outside suppliers for items of in-house manufacture?
10. What do automakers have to invest into in order to start a production of a new model?
11. What parts does a uniform modern assembly line consist of?
12. How does the system of sales and service organizations work?
13. How does the restricted franchise dealership function?
14. Why is the e-market for new brand cars in its infancy?
15. Why does the market in used cars play an important part of the distribution system for motor vehicles?
16. What is a key problem with the worn out and discarded motor vehicles?
17. How do car manufacturers solve the problem?

Exercise 5. Match the words in English (1-15) with their Russian equivalents (a-o).

1. equipment	a. сборочный завод
2. tooling	b. инженерия; конструирование
3. assembly plant	c. реинжиниринг; переконструирование
4. mock-up	d. ручная операция
5. engineering	e. дилерский центр, работающий по франшизе
6. launch	f. оборудование
7. reengineering	g. объём продаж; сбыт

8. assembly line	h. макет в масштабе 1:1
9. automatic control system	i. средства и оборудование для технического обслуживания
10. manual operation	j. автомобилестроение
11. franchise dealership	k. оснащение инструментами
12. sales	l. система распространения
13. servicing facilities	m. сборочный конвейер
14. distribution system	n. система автоматического управления
15. motor vehicle industry	o. запуск

Exercise 6. Read about assembly lines. Complete the sentences with the words given in the box.

Merge, where, welding, passenger, assembly, wheels, joined, styles, uniform, body

Information source: <https://www.britannica.com/technology/automotive-industry>

1. The assembly process itself is quite 2. As a rule, there are two main ... lines – body and chassis. 3. On the first line, the body panels are welded together, the doors and windows are installed, and the ... is painted and trimmed with upholstery, interior hardware, and wiring. 4. On the second line, the frame has the springs, ..., steering gear, and power train (engine, transmission, drive shaft, and differential) installed, plus the brakes and exhaust system. 5. The two lines ... at the point at which the car is finished except for minor items and necessary testing and inspection. 6. A variation on this process is so called ‘unitized’ construction, ... the body and frame are assembled as a unit. 7. In this system the undercarriage still goes down the chassis line for the power train, front suspension, and rear axle, to be supported on pedestals until they are ... to the unitized body structure. 8. Most ... vehicles today are manufactured by the unitized method, and most trucks and commercial vehicles still employ a separate frame. 9. Assembly lines have automatic control systems, transfer machines, computer-guided ... robots, and other automated equipment. 10. A universal form of automatic control has used computers to schedule assembly operations so that a variety of ... can be programmed along the same assembly line.

Exercise 7. Match the words in English (1-22) with their Russian equivalents (a-o).

1. chassis	a. обивка; обивочный материал
2. body panel	b. силовая передача, трансмиссия
3. upholstery	c. тормозной механизм; тормоз
4. hardware	d. несущая система автомобиля; ходовая часть
5. wiring	e. подвеска передних колёс; передняя подвеска
6. spring	f. панель кузова
7. steering gear	g. пробки на дорогах
8. power train	h. загрязнение воздуха
9. drive shaft	i. пружина; рессора
10. transmission	j. меры обеспечения безопасности
11. brake	k. проводка
12. exhaust system	l. ведущий вал
13. undercarriage	m. ходовая часть; шасси; рама
14. front suspension	n. несчастный случай на автомобильной дороге
15. rear axle	o. ремень безопасности
16. traffic jams	p. воздушная подушка безопасности
17. air pollution	q. коробка передач

18. highway accident	г. подача топлива
19. safety features	с. комплектующее оборудование
20. seat belt	т. задняя ось; задний мост
21. air bag	и. рулевой механизм
22. fuel supply	в. система выпуска отработавших газов

Exercise 8. Read about the economic and social significance of the automotive industry. Match favorable effects (1-7) with their descriptions (a-g).

Information source: <https://www.britannica.com/technology/automotive-industry>

1. Maintenance of the healthy international trade balances	a. The general use of automobiles created a strong demand for better highways. The improvement of existing road networks started. Experience demonstrated that roads for automobile traffic needed to be differentiated functionally, depending on whether they were intended for through traffic or local traffic.
2. Development of other industries and auto-related businesses	b. A historian has said that Henry Ford freed common people from the limitations of their geography. The motor vehicle has created mobility and changed living habits and social customs. The highway transportation encourages business and industry to move to sites where land is cheaper, access by car and truck is easier than in crowded cities, and space is available for the one-storeyed structures that permit optimum use of modern materials-handling techniques. Motor vehicles and paved roads have narrowed much of the gap between rural and urban life. Farmers can ship easily and economically by truck and can drive to town when convenient. In addition, such institutions as regional schools and hospitals are now accessible by bus and car.
3. Highway development	c. The automotive industry has become a vital element in the economy of the industrialized countries. Motor vehicle production and sales are one of the major indexes of the economy state. For the UK, Japan, France, Italy, Sweden, Germany and South Korea, motor vehicle exports are essential to the maintenance of good trade balances with other countries.
4. Mobility and freedom	d. There has been a striking development of businesses such as drive-in and drive-through eating establishments and of commercial developments, such as shopping malls, that are designed to be accessed primarily by car.
5. Development of the credit purchase practice	e. The automobile permits nearly everyone in the automotive countries to travel for recreation. The motor vehicle allows for such auxiliary devices as trailers (called caravans in Europe), campers, trailers for boats and off-road vehicles, and bicycle and ski racks, which broaden the scope of recreational opportunities.
6. Development of new businesses related to increasing car use	f. The effect of motor vehicle manufacturing on other industries is very great. Special requirements of automotive mass production have had a profound influence on the design and development of highly specialized machine tools and have stimulated technological advances in petroleum refining, steelmaking, rubber production, paint and plate-glass manufacturing, and other industrial processes. The indirect positive effects are also considerable in the auto-related

	businesses, such as motor freight operators, highway construction firms, and truck transportation.
7. Development of the recreational travelling	g. The marketing of automobiles has stimulated a great expansion in the use of credit. The technique was introduced into the American automobile industry in 1916. It became a universal practice in nearly all countries in the purchase of motor vehicles, and it accustomed people to buying other durable consumer goods in the same way.

Exercise 9. Work in pairs. Read and translate a dialogue between two students. Act it out.

Information source: <https://www.britannica.com/technology/automotive-industry>

Student 1: Are there any adverse effects of the mass car use?

Student 2: Yes, sure. There are some unforeseen and undesirable consequences. For example, traffic jams, an air pollution, and highway accidents.

S. 1: Yeah, traffic jams at peak hours in Novosibirsk can be really horrendous!

S. 2: That's because most city street systems have not been designed for a heavy automobile traffic. Besides, there is a lot of transit traffic. The local authorities try to solve the problem. A bypass highway is being constructed; the need to develop a better public transport system in the city, a suburban buses and commuter electric trains systems has been much discussed.

S. 1: Sounds great! And what about the smog? I understand that automobile exhaust makes only a half of the atmospheric pollutants in large cities but still...

S. 2: Well, there are some laws about motor vehicle fuel economy aimed at reducing the carbon dioxide emission. Besides, many automobile manufacturers have undertaken development of alternative, less-polluting power sources, such as fuel cells.

S. 1: Fuel cells? What do you mean?

S. 2: They convert hydrogen derived from gasoline, natural gas, methanol, or other sources and oxygen into electricity to power an electric motor.

S. 1: Ah, I see now. By the way, policy makers focus not only on fuel economy but also on reduction of fatalities in highway accidents. They introduced speed limits. In most countries of the world speed limits range from about 65 km (40 miles) to 120–130 km (75–80 miles) per hour. But in Germany, India and the Philippines, speed limits traditionally are not prescribed.

S. 2: Really? Do they rely on the safety features? I mean seat belts and air bags.

S. 1: Most probably, they do. Interesting to know that in the early 21st century, the UK and the European Union supported a controversial idea to equip new cars with a speed-control device that would use global positioning satellites to track a vehicle's location and, with the help of an onboard digital road map, cut off the car's fuel supply if local speed limits were exceeded.

S. 2: Sounds incredible!

Exercise 10. Search the Web for more information about favourable and adverse effects of the automobile industry in Russia and make a presentation about it.

Exercise 11. 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. CAR MANUFACTURING PROCESS

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

1. guide руководство, инструкция; описание
2. car manufacturing автомобилестроение; производство автомобилей
3. assembly line сборочный конвейер
4. supply chain management (SCM) управление цепочками поставок
5. car manufacturing plant завод по производству автомобилей
6. launch выпуск новых товаров на рынок
7. timeline график работ
8. sound condition в работоспособном и технически исправном состоянии
9. sheets of metal листовые заготовки
10. artisan мелкий производитель
11. attach прикреплять; присоединять; подключать
12. robotic work cell роботизированный гибкий производственный модуль
13. weld сваривать; заваривать; варить
14. solder паять; припаивать; спаивать; запаивать; спайка
15. screw завинчивать; ввинчивать; скреплять винтами или болтами
16. glue клеить; приклеивать; наклеивать
17. raw materials сырье
18. sustainable экологически устойчивый; не наносящий ущерба окружающей среде
19. lightweight лёгкий; облегчённый
20. cost-effective рентабельный
21. green product экологически чистый продукт
22. draft проектировать; разрабатывать
23. revision исправление, доработка, изменение, модификация
24. newsworthy представляющий интерес для средств массовой информации; достойный; важный; заслуживающий внимания
25. aerodynamics аэродинамические характеристики
26. safety безопасность; надёжность
27. fuel economy расход топлива; экономия топлива
28. cost analysis анализ затрат
29. engineering specifications технические условия
30. stamping plant штамповочный цех
31. press shop кузнечно-штамповочный цех
32. bodywork конструкция кузова; кузов легкового автомобиля рамной конструкции
33. hood капот
34. roof крыша
35. body shop кузовной цех
36. pressed steel part штампованная деталь/заготовка из стали
37. detailing детализация
38. layering наслаивание; нанесение слоями
39. chemical substance химическое вещество
40. scratch царапина
41. paint shop окрасочный цех
42. coating покрытие; покрывающий слой; грунтовка
43. inspection system система приёмочного контроля

44. irregularities нарушения; неровности; изъёмы
45. powertrain силовая передача, трансмиссия
46. body shell корпус автомобильного кузова
47. tyre шина; покрышка
48. mounting монтаж, сборка; установка
49. mechanical elements механический элемент
50. driving position место водителя
51. mirror зеркало
52. interior trim внутренняя отделка; отделка салона (автомобиля)
53. quality assurance (QA) обеспечение качества
54. imperfection дефект, недостаток, изъян
55. inconsistency несовместимость; несоответствие
56. DMV (Department of Motor Vehicles) отдел транспортных средств
57. steering alignment регулировка рулевого управления
58. headlight фара (на передней части транспортного средства)
59. reach охват; радиус действия
60. water pressure давление воды, напор воды
61. leak течь, протечка; утечка
62. accessibility лёгкость использования, осмотра, ремонта и т.д.; доступность для осмотра или ремонта
63. crash test краш-тест, аварийное испытание; испытание на удар при столкновении
64. impact динамическое воздействие; толчок; удар; столкновение
65. marketing strategy маркетинговая стратегия
66. market research маркетинговое исследование, изучение конъюнктуры рынка
67. marketing theme лейтмотив маркетинга; основная тема маркетинга
68. marketing scheme программа сбыта продукции; система маркетинга

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

Manufacturing, innovation, line, management, design, material, technology, industry, process, concept, typically, start, finish, original, interest, metal, classic, robot, robotic, transform, idea, reality, company, product, public, interior, exterior, functional, potential, innovative technologies, brand, model, 3D form, test, aerodynamics, economy, electrical functionality, analysis, specification, standard, press, stop, individual, pressed, structure, aluminium, final form, detail, cleaning, chemical, corrosion, result, inspection system, aspects, cylinder, chassis, mechanical element, defect, program, marketing strategy, marketing scheme, private dealer.

Exercise 3. Read and translate Text 1. Match the Parts 1-9 to their titles (a-j).

Part 1	a. Body Shop
Part 2	b. Final Inspection, Testing and QA
Part 3	c. Engine Assembly Line
Part 4	d. Launch
Part 5	e. Raw Materials
Part 6	f. Design and Engineering
Part 7	g. Press Shop
Part 8	h. Paint Shop
Part 9	i. Robots and Workers in Car Manufacturing Process

Text 1. A Step-by-Step Guide on Car Manufacturing

Sources: <https://www.group1cars.co.za/blog/car-manufacturing-process/>,
<https://nrtcautomation.com/blog/step-by-step-process-of-manufacturing-a-car>

Car manufacturing has come a long way since the early days with Henry Ford's innovation on assembly lines and supply chain management. However, vehicle design and the materials used today have become far more complicated as technology develops and industry demand changes. Not all car manufacturing plants operate in the same way but the process involves similar steps from concept and design to production and launch. It typically takes around two to five years to make a car from start to finish. This long timeline is needed to ensure the car is in sound condition for public use as well as to develop original designs that will spark interest within a large market.

Part 1

A car manufacturing process starts with sheets of metal as building cars often involves recycled materials. It's worth noting that artisans build classic cars by hand but most of today's cars are made by robots on an assembly line. The cars travel along a moving assembly line in a factory as robots and people work on them. Manufacturing plant workers attach parts to the car and may work alongside robots for certain tasks. Robotic work cell will work alone to weld, solder, screw, and glue parts onto the car.

Part 2

Car manufacturers need raw materials to transform the car from an idea to a reality. Many companies are looking for more sustainable, lightweight and cost-effective materials for their cars to keep up with the demand for greener products.

Part 3

Carmakers have to work hard as the design must meet the public's needs and desires for a car. Once the design is drafted, it'll go through many revisions to perfect it. The interior and exterior must also be attractive and functional to potential buyers while including innovative technologies that make the car newsworthy and competitive to other brands. Smaller-scale models of the car are made in 2D and 3D forms to help engineers test the car's design. This includes aerodynamics, safety, hot and cold weather, fuel economy, electrical functionality, cost analysis, etc. The car manufacturing process can only begin after the design and engineering specifications have been checked, tested and approved. Even though each car manufacturer follows its own process, there are some set standards.

Part 4

Production starts at the stamping plant or press shop. The sheet metal parts for the bodywork are created and stamped by robots. These parts form side frames, doors, hoods, and roofs, which are later added onto the main frame of the car.

Part 5

The next stop on the assembly line is the body shop where individual pressed steel parts are put in place and on the desired single-body structure. This second step in the car manufacturing process also involves joining the sheet metal and aluminium parts to create the final form. Once the parts of the body are manufactured onto the car, it will undergo detailing.

Part 6

The third step in the car manufacturing process includes cleaning, layering chemical formulas for protection against corrosion and scratches, and painting. The body shop sends the entire frame to the paint shop where they add a coating to protect against corrosion. This is done in a dust-free environment to ensure only the best results. After applying a coat of paint, the car body undergoes a paint inspection system to rule out any irregularities.

Part 7

The engine/powertrain assembly line is the heart of the car manufacturing process as this is where all the testing takes place. It involves multiple aspects, such as the performance of each engine cylinder. On this assembly line various parts are attached to the painted body shell, including the engine, chassis, and tyres. The last part of the assembly process involves mounting certain mechanical elements from the driving position and mirrors to the interior trim of the vehicle.

Part 8

When all of the stages of production have been completed, the fully-assembled car is thoroughly inspected to ensure there are no defects before sending it to car dealerships. The car is tested for quality assurance and safety. First, the vehicle is checked for any imperfections or inconsistencies in the interior and exterior design. Second, the car runs through a series of tests similar to those given at a DMV: the engine is started and stopped several times, the steering alignment is adjusted, the headlights are checked for brightness and reach, brakes are tested for safety, and more. Then, the car will be tested in heavy water pressure to find leaks. After that, the car's programming is tested, and the electrical units are checked to ensure safety and accessibility. Finally, crash testing is executed to observe how the car handles impacts, and to test airbag and seat belt performance. If the car passes all tests and requires no further changes, the company can present it to the market, develop a marketing strategy and define the best price.

Part 9

After performing market research, developing a marketing theme and marketing scheme, and defining the price of the car, the car will be produced for car dealerships and private dealers to sell to the public.

Exercise 4. Answer the questions.

1. Who introduced assembly lines and supply chain management?
2. How long does it normally take to make a car from concept and design to production and launch?
3. What does the car manufacturing process start with?
4. What kind of tasks do workers and robots perform at the plant?
5. What are the key characteristics of raw materials used for making a car?
6. What are the requirements for a car's design?
7. What does the car's design test include?
8. When can the car manufacturing process begin?
9. What operations are performed at the press shop?
10. What does the second step in the car manufacturing process involve?
11. What is the role of the paint shop in the car manufacturing process?
12. Why is the engine assembly line regarded to be a central part of the car manufacturing process?
13. What is a fully-assembled car tested for?
14. When can a company present a car to the market?
15. When will the car be produced for selling to the public?

Exercise 5. Match the words in English (1-18) with their Russian equivalents (a-r).

1. assembly line	a. производственная линия; поточная линия
2. production task	b. лабиринт
3. production line	c. бракованный; дефектный
4. to perform	d. измельчать

5. maze	е. изготовленный вручную
6. landfill	ф. разделение труда
7. flawed	г. сборочный конвейер
8. to recycle	h. отчуждённость; умопомешательство; психоз
9. to ground	і. машины; машинное оборудование; механизмы
10. hand-crafted	ј. стандартизованный
11. to mold	к. неквалифицированный; необученный; неопытный
12. alienation	l. закапывание мусора, отходов; мусорная свалка
13. stake	м. строительство новой модели автомобиля на одной платформе с предшественником или с другой моделью концерна
14. division of labor	н. производственное задание
15. machinery	о. доля, участие, процент
16. unskilled	р. формовать
17. standardized	q. выполнять; делать, совершать
18. platform sharing	г. повторно использовать; возвращать в оборот (отходы производства); перерабатывать

Exercise 6. Read about automotive production lines. Match the titles (1-5) with the passages (a-d).

Information source: <https://auto.howstuffworks.com/under-the-hood/auto-manufacturing/automotive-production-line.htm>

1. Production Lines	a
2. Early Automotive Production Lines	b
3. Modern Automotive Production Lines	c
4. Recent Changes to Automotive Production Lines	d
5. Alternative Automotive Production Lines	e

a. While many people think that Henry Ford invented the automotive assembly line, it was actually invented by Ransom Eli Olds. Olds had worked on cars for most of his life, including steam-powered cars in the 1880s and 1890s. His assembly line allowed him to be the first mass-producer of cars in the USA, and he dominated the American automotive industry from 1901 to 1904. Henry Ford took the idea and improved it. Ford's line assigned workers to one specific production task. Each task had a production station. A car arrived at the station, and the worker performed the specified task. As each worker had one task and worked on just one car at a time, it meant that hundreds of cars were being built simultaneously throughout the factory. A Ford Model T could be assembled in 93 minutes from start to finish. In fact, every three minutes, a completed car rolled off the production line.

b. While the basic principles of automotive production lines are the same, recent innovations have changed things a bit. Robots now perform some of the tasks that human autoworkers formerly were asked to perform. Besides, new automotive production lines have clean, light and open architecture. The BMW assembly line in Leipzig, Germany, is a great example of that. The assembly line, which is a light-filled maze of glass, winds its way through the factory. Moreover, automakers do their best to clean up the environment. At the Subaru plant in Lafayette, Ind., 99.8 percent of the plant's waste is recycled. At the factory, which builds the Subaru Tribeca, Legacy and Outback, as well as the Toyota Camry, the goal is to contribute zero waste to landfills. Other automakers, including Honda and Toyota, persuade suppliers to take back and reuse packaging. Even imperfect parts are recycled. For instance, at the Subaru plant, flawed plastic bumpers are ground into plastic pellets to make new bumpers.

c. Some car companies have never really applied the production line process to their product; their cars remain entirely hand-crafted. High priced cars from automakers like Aston Martin and Ferrari are hand-built to their customer's specifications. In some cases, car makers will even mold the driver's seat to the buyer's shape. Other cars are built using a combination of these two techniques. The Chevrolet Corvette, for example, has a hand-built engine, but other parts of the car are assembled on the production line.

One of the problems that face car companies is how to keep the workers happy and interested in the products they build. Alienation is a common problem for production line workers because the tasks they perform can often be boring and extremely repetitive. Toyota company offered its method to solve the problem. Toyota factories in Japan are designed to be happy places, where automated delivery cars play cheerful songs as they go by. If a worker spots a problem, he or she is encouraged to stop the production line and fix it, even though stopping and starting the line is very expensive. Also, as a group, employees exercise together and workers are continually invested in and given a stake in the company. After seeing Toyota's success, other car makers have started using the same principles.

d. A production line uses a division of labor. Instead of each person doing an entire job from start to finish, everyone takes a small piece of the job, bringing the smaller parts together until the work is done. People discovered that any production process could move a lot faster, if it is mechanized. Also, with more machinery involved, the people making the product could be less skilled. For instance, instead of knowing how to sew, workers simply had to run fabric through a sewing machine. The process was faster, and because the labor was unskilled, it was cheaper, too. The idea to introduce production lines made it possible to transfer to mass production of a variety of products including cars.

e. Up-to-date automotive production lines haven't changed much. The cars still come to the workers at individual work stations. Each worker performs a specific task and when all the tasks are done, at the end of the line, you'll see brand new ready-to-drive cars rolling off the assembly line. On modern production lines, many of the parts that go into assembling a car aren't made on-site. Instead, car companies buy parts from other suppliers. To stay in business today, car companies need to offer lots of different models; something that's hard to do when you're dependent on a production line which is intended to produce standardized products. So, car companies apply a platform sharing. With the platform sharing, a car company designs its cars to share parts. It saves the company money, makes production easier and gives consumers what they want. Platform sharing means that, e.g., a Chevy Silverado and a Chevy Tahoe look alike and have similar capabilities because they share parts, making it easy for GM to meet consumers' needs.

Exercise 7. Read about the influence of the automotive production lines on the American life. Complete the sentences with the words given in the box.

Process, price, class, cars, down, moved, revolutionized, assembly, afford
--

Information source: <https://auto.howstuffworks.com/under-the-hood/auto-manufacturing/automotive-production-line.htm>

1. We've all seen production or ... lines, either in documentaries or in movies like Charlie Chaplain's 'Modern Times', or in the famous chocolate factory scene from 'I Love Lucy'. 2. But the most interesting and complex product that is built in a line system is ... and trucks. 3. Automotive production lines ... the automotive industry, as well as the American life. 4. They made the ... of building cars more efficient. 5. Due to the increase in efficiency, the car production cost went 6. As a result, the retail ... of the cars also became lower. 7. This price reduction meant more people could ... to buy a vehicle of their own. 8. Also, because of the massive number of workers needed to staff these lines, millions of

Americans ... away from farms into the cities, transforming the economy from one based on agriculture to one based on manufacturing. 9. At the same time, the relatively high wages and good benefits offered by automotive manufacturers helped pull many families into the American middle ... , changing America's social makeup for generations to come.

Exercise 8. Work in pairs. Read and translate a dialogue between an interviewer and an expert. Act it out.

Information source: <https://auto.howstuffworks.com/under-the-hood/auto-manufacturing/do-car-interiors-turn-toxic-in-the-summer.htm>

Interviewer: Do car interiors turn toxic in the summer?

Expert: Car interiors are actually toxic all year round. However, there are two times when the chemicals are at their highest levels: when the car is brand new, and in the summer.

I.: Do you mean that 'new car smell'? I love it!

E.: Yeah, some people love it and others can't stand it. You know, freshly manufactured materials have compounds that get released as the car's parts start to get used. I mean the seats being sat in, the dashboard controls being touched, the carpet being rubbed and so on.

I.: But over time, this smell disappears.

E.: You're right. This process is called 'offgassing'. But the smell comes back in the summer. When it gets hot outside, some of the toxic fumes start to get released again. That's because heat speeds up offgassing.

I.: Are there many chemicals in an average car?

E.: Well, there are around 275 possible contaminants, with about 50 being the most common.

I.: Really? What are the main categories of them?

E.: First, vinyl, the cheap plastic-like upholstery material; it is one of the worst. Second, formaldehyde. Then, flame retardants, which help protect the cars' occupants from the heat of the engine bay and exhaust; and finally, heavy metals and various plastics used to make the dashboard, door handles and armrests.

I.: Are they harmful?

E.: Yes, of course. The symptoms are nausea and headaches, which many people might not even think is related to their new car. Over time, there can be more serious problems with the central nervous system, hormones, memory loss and so on.

I.: And do car manufacturers do anything to reduce the chemicals used in vehicle interiors?

E.: Yes, they do. But there is no federal testing or a standard for acceptable chemical levels in the United States.

I.: Okay. And what shall we do to cope with offgassing?

E.: The best way is to keep the car well ventilated. Right after buying the car, keep the windows down as much as possible to let fresh air circulate inside. In the summer, keep the windows open just a little, if possible, and use UV-resistant sun shields in the windows to keep sunlight off the plastics and upholstery materials.

I.: And I think the best tactic is to spend as less time as possible in the car.

E.: Ha ha. Most of drivers don't agree with you. By the way, another important tip is to leave the windows down for a few minutes before starting the air conditioner. It might be uncomfortable, but it'll allow some of that gas to escape before getting sucked into the air conditioning system.

Exercise 9. Search the Web for the development and recent changes of automotive production lines in Russia and make a presentation about it.

Exercise 10. 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. AUTOMOTIVE QUALITY CONTROL TECHNIQUES

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

1. quality control контроль качества
2. appliance аппарат, прибор; приспособление, устройство
3. break поломка; ломать(ся)
4. reliable безотказный; надёжный
5. car makers производители автомобилей
6. ensure гарантировать, обеспечивать
7. bug повреждение, неисправность; помеха; технический дефект; конструктивный недостаток; недоделка; сбой; отказ; неполадки; ошибка
8. operational связанный с работой, эксплуатацией, функционированием
9. rigorous строгий; доскональный, скрупулёзный, тщательный; точный
10. well-engineered хорошо продуманный; хорошо сконструированный
11. safe безопасный; надёжный
12. assembly line сборочный конвейер
13. weakness слабое место, недостаток; дефект
14. mechanical problem механическая неисправность
15. vet испытывать, оценивать, проверять; проверять благонадёжность
16. production line производственная линия; технологическая линия; поточная линия
17. fluid leakage утечка жидкости
18. air leak утечка воздуха
19. assembly монтаж; сборка
20. to hit the road отправляться в путь
21. surface поверхность
22. smoothness гладкость; плавность
23. durability долговечность; срок службы; износостойкость; прочность
24. suspension подвеска
25. mechanical component механический компонент, механическая деталь
26. door seal уплотнение двери
27. window seal уплотнитель окна
28. airtight воздухонепроницаемый, герметичный
29. crash test краш-тест, испытание на удар при столкновении
30. insurance страхование
31. safety system система обеспечения безопасности
32. occupant пассажир
33. technological advances технологический прорыв; научно-технический прогресс
34. mimic имитировать, воспроизводить
35. testing center испытательный центр
36. measurement измерение; замер
37. response реакция; реагирование; скорость срабатывания
38. fitted смонтированный; установленный
39. part элемент; деталь; узел; часть
40. weld сварной шов, сварное соединение
41. come forward предлагать что-либо; высказывать свое мнение

42. commitment обязанность, долг; активное, ответственное отношение к чему-либо; заинтересованность

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

Real, enthusiast, toaster, blender, modern, automobile manufacturing, control, industry, process, product, comfortable, start, production, model, company, prototypes, test, mechanical problems, details, polished, design, extreme, engineers, component, type, occupant, California, center, sensor, computer program, automated, system, detected, result, corporate culture.

Exercise 3. Read and translate Text 1.

Text 1. Advances in Automotive Quality Control

Information source: https://auto.howstuffworks.com/under-the-hood/automotive-quality-control.htm?utm_source=howstuffworks&utm_medium=recirc

Most people probably don't think too much about their cars on a daily basis – unless he or she happens to be a real car enthusiast, of course. But for the vast majority of buyers, a car is simply an appliance. And, like the toaster or blender sitting on your kitchen counter, cars don't tend to take up a lot of space in their owners' brains. That is, until the car somehow breaks.

The thing is that modern cars are more reliable than ever before. That's because car makers have begun to master a key step in automobile manufacturing: a quality control. In any industry, the quality control is a process that's used to ensure that a product is free from bugs, operational issues and any number of other problems you can think of. In auto manufacturing, that means cars go through rigorous testing to make sure they're well-engineered, safe and comfortable.

The quality control process starts long before the first production models of a vehicle roll off the assembly line. When a car company releases a new product, they build prototypes, which are then tested to find weaknesses, mechanical problems and other details that could be improved. Once the prototypes have been vetted and polished, the design goes into production, where quality control continues on the production line, too. After being built, each car is tested for problems like fluid leakages and air leaks, mechanical problems and proper assembly.

Now let's move onto the way the automotive quality control works and the extreme tests that your car has to go through before it is allowed to hit the road.

Engineers have designed several tests to determine how well a car will stand up to real-world (and extreme) use. For instance, they drive the prototype car over specially designed surfaces to test the smoothness of the ride and the durability of the suspension. They also expose the cars to extreme heat and cold weather to test how the various mechanical components will work in all types of weather. They even fill a car with smoke and then check all the window and door seals to insure it's airtight.

One of the most well-known quality control tests is the crash test. While most people are familiar with government and insurance industry crash tests, car makers also run their own tests to make sure its products and safety systems will work as they were designed to and protect the vehicle's occupants.

Now let's talk about advances in automotive quality control. Due to up-to-date technological advances the quality control tests can be more closely controlled, and even more extreme. While car makers still do a lot of testing in the real world (like driving through Death Valley, California, to test how well a car handles hot weather), they can mimic and

even exceed real-world conditions in their own testing centers. Also, thanks to more precise sensors and computer programs, they can take more detailed measurements of a car's responses to the tests. Finally, they've also been able to add automated quality control systems to assembly lines, so something like a poorly fitted part or a bad weld can be automatically detected and dealt with.

Still, despite the incredible advances in automotive quality control, the most important component in building a quality car is the human touch. As a result, many car makers try to build a corporate culture where every single employee is responsible for quality. If they see a problem with a product, employees are encouraged to come forward so the company can make it right. Of course, that doesn't necessarily prevent all quality issues at the factory, but a sharp set of human eyes and a commitment to building the best car may help keep the company's cars safe and running properly.

Exercise 4. Answer the questions.

1. What is a car for the vast majority of buyers?
2. What step in automobile manufacturing have car makers started to master?
3. What does a quality control mean in automobile manufacturing?
4. When does the quality control process start?
5. What are prototypes tested for?
6. What problems is each of built cars tested for?
7. How does the automotive quality control work?
8. What are the extreme tests that a car has to go through?
9. What is the most well-known car quality control tests?
10. Why do car makers run their own tests?
11. How can up-to-date technological advances improve the quality control tests?
12. Why are more precise sensors and computer programs used in testing cars?
13. Why are automated quality control systems added to assembly lines?
14. Why do workers still play an essential role in the car production?
15. What is the idea of a corporate culture that most car makers try to build?

Exercise 5. Match the words and word combinations (1-5) with their descriptions (a-e).

1. a prototype	a. to set out on a journey
2. vetted	b. an arrangement of machines in a factory where the products pass from machine to machine until they are finished
3. an assembly line	c. a new type of car which is not yet ready to be made in large numbers and sold
4. to hit the road	d. checked carefully to make sure that it is acceptable
5. a production line	e. an arrangement of workers and machines in a factory, where each worker deals with only one part of a product; the product passes from one worker to another until it is finished

Exercise 6. Read about the automotive quality control. Complete the sentences with the words given in the box.

Prototypes, control, ensure, mechanical

Automotive Quality Control

Source: <https://www.hqts.com/automotive-parts-inspection/>

1. In the automotive industry quality ... is a lengthy process both in terms of bringing a new model to market as well as in ensuring that every vehicle built during the entire

production cycle is up to the highest possible standard. 2. Prototype models are built and tested to find any ... problems or issues which need to be improved or changed. 3. Once the ... have been inspected, the design will go into production and quality control continues with every vehicle. 4. After the building work is completed, each car is inspected and tested for any further issues such as, fluid or air leaks, mechanical problems and to ... the vehicle has been accurately assembled.

Exercise 7. Read about the Automotive Parts Inspections. Match the Parts of the text (1-3) with their titles (a-c).

Part 1	a. Visual Inspection of Engine and Brake System Components
Part 2	b. Other Automotive Parts to be Inspected
Part 3	c. Quality Control at Automotive Parts Factories

Automotive Parts Inspections

Source: <https://www.hqts.com/automotive-parts-inspection/>

Part 1

Quality control is important in all industries but for manufacturers of automotive parts it is vital to ensure that each and every product leaving the factory is of the very highest quality. Today new cars are more reliable than ever before. As car producers invest in top-quality control inspections, the manufacturers who form an essential part of their supply chain must do the same. The automotive industry has very little room for error when it comes to safety and manufacturing efficiency; yet stories of expensive recalls still persist.

Part 2

Visual inspections will take place to look for any issues, as even the smallest of defects could potentially be the root cause of accidents or expensive recalls. In order to achieve an efficient and long-lasting engine the cylinder head and block are visually inspected, focusing on the oil bore holes, oil lines and cooling channels. Secondly, the brake system is the most important safety component of a vehicle and the master cylinder, the brake calliper, brake discs and fluid all need to be visually tested during the production process. It is critical to ensure that the automotive parts used in these areas are of high quality in order to improve safety and usability and decrease the risk of recall.

Part 3

It is essential that all parts used in the assembly process satisfy specified quality criteria. As mentioned above, components for the engine and for the brake system are particularly critical engine parts but the list continues with automotive interiors and exteriors, powertrain components, brake fittings, steering systems, wheel systems, undercarriage components, body parts, travel accessories, the full range of electrical instrumentation accessories, any specific modification such as toughened bodywork and glass, security systems, comprehensive accessories, audio and video appliances, chemical care, maintenance equipment and power tools can all be visually inspected and checked against drawings and specifications.

Exercise 8. Work in pairs. Read and translate a dialogue between two transport engineers. Act it out.

Information source: <https://habr.com/en/company/top3dshop/blog/647297/>

Engineer 1: Look! A ScanTech KSCAN20 3D scanner has just been delivered.

Engineer 2: Fine! Is it the one used for quick quality control of the automotive parts?

E. 1: Yeah! It's portable and can be used for a wide range of applications in the fields of quality control, production design, engineering analysis and others.

E. 2: Here is the manual. Let's have a look at the characteristics.

E. 1: Well, the acquisition speed is 650,000 points per second. And the accuracy is up to 0.02 mm.

E. 2: It's impressive! What lasers does it use?

E. 1: The blue ones. The 0.01 mm resolution in the Hyperfine B mode! And it has a built-in photogrammetry, volumetric accuracy of up to 0.035 mm/m.

E. 2: Great! And how does it work?

E. 1: Let's see... here is the description of the quality control process. The first step is placing the markers. Then, scanning and getting digital data. After that, data processing, working with software. And finally, calculating deviations, generating a report.

E. 2: So, using this scanner and related software solutions will allow us to speed up the quality control process. It will significantly improve the efficiency of our auto parts production.

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. 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 шоссе/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 Chal-

lenger 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. Read about the term Sedan. Match the Parts of the text (1-4) with their titles (a-d).

Part 1	a. How Word Sedan Has Changed Over Time
Part 2	b. Origin of Term
Part 3	c. International Terminology
Part 4	d. General Description of Sedan Car

A Sedan Car: Terminology

Information source: <https://automobile.fandom.com/wiki/Sedan>

Part 1

A sedan car, American English terminology (a saloon in British English), is one of the most common body styles of the modern automobile. At its most basic, the sedan is a passenger car with a separate hood (bonnet in British English), covering the engine in the front, and a separate trunk (boot in British English), for luggage at the rear – the archetypal "3-box" car.

Part 2

Historically, the usage of the term sedan has changed over time. Several versions of the body style exist, including four-door, two-door and fastback models. A sedan seats four or more and has a fixed roof that is full-height up to the rear window. Most commonly it is a four-door; two-door is rarer but they do occur. In the U.S., this term has been used to denote a car with fixed window frames, as opposed to the hardtop style where the sash, if any, winds down with the glass. As hardtops have become rarer, this distinction is no longer so important.

Part 3

As to the origin of the word sedan, it is possibly derived from a southern Italian dialect derivative of Italian sede "chair" (the first sedan was said to have been introduced from Naples). The derivation from the town of Sedan in France, where it was said to have been made or first used, lacks historical evidence, according to Oxford English Dictionary. The word sedan was later used to refer to a litter or windowed box containing a passenger seat carried by two or more bearers.

Part 4

Talking about the international terminology, it should be mentioned that in North American English, the term sedan is used.

In British English the configuration is called a saloon and has its engine under the bonnet at the front, and a boot for luggage at the rear. The British English term is sometimes used by British car manufacturers in the United States: the Rolls-Royce Park Ward was sold as a saloon in the United States, while the smaller Silver Seraph was called a sedan.

In Australia and New Zealand, the American term is now used, though with the British terms of boot and bonnet being retained. In other languages, sedans are known as

Limousine (German), Berline (French), Berlina (Spanish and Italian), although these terms also may include hatchbacks. These terms, besides sedan, derive from types of horse-drawn carriages.

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

Book 2

Unit 1. COMPONENTS OF THE AUTOMOBILE

Источник: Шляхова А.В. Английский язык для студентов автомобилестроительных специальностей средних профессиональных учебных заведений: учебное пособие / В.А. Шляхова. – Москва: Высшая школа, 2008. – 120 с.

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

1. engine (power plant) двигатель (силовая установка)
2. chassis шасси
3. body кузов
4. power train силовая передача
5. running gear ходовая часть
6. steering system рулевое управление
7. brakes тормоза
8. clutch сцепление
9. gearbox коробка передач
10. propeller shaft карданный вал
11. final drive главная передача
12. differential дифференциал
13. rear axle задний мост
14. axle shafts полуоси
15. frame with axles рама с осями
16. wheels and springs колеса с рессорами
17. hood капот
18. fenders крылья
19. heater отопитель
20. windshield wiper стеклоочиститель
21. include включать в себя
22. consist of состоять из
23. as well также
24. in turn в свою очередь
25. source of power источник энергии
26. fuel топливо
27. cooling охлаждение
28. lubricating смазка

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

Automobile, chassis, electric, system, control, differential, ventilator, cylinder.

Exercise 3. Read and translate the text.

Components of the Automobile

The automobile is made up of three basic parts: the power plant, or the engine, the chassis and the body.

The engine is the source of power that makes the wheels rotate and the car move. It includes fuel, cooling, lubricating and electric systems. Most automobile engines have six or eight cylinders.

The chassis includes a power train (power transmission), a running gear, steering and braking systems as well. The power train carries the power from the engine to the car wheels.

The power transmission, in turn, contains the clutch, gearbox, propeller or cardan shaft, final drive, differential, rear axle and axle shafts.

The running gear consists of a frame with axles, wheels and springs.

The body has a hood, fenders and accessories: the heater, stereo tape recorder, windshield wipers, conditioner, speedometer and so on.

Exercise 4. Read and translate the terms given in the box, match them with the appropriate parts of the automobile (1-3).

Fuel system, axle shaft, accessories, cooling system, frame with axles, running gear, lubricating system, steering system, heater, propeller shaft, power transmission, final drive, windshield wiper, clutch, wheels and axle shafts, gearbox, electric system, differential.

1. the engine;
2. the chassis;
3. the body.

Exercise 5. Answer the questions to the text.

1. What main parts is the automobile made up of?
2. What is the function of the engine?
3. What systems does the engine include?
4. What does the chassis consist of?
5. What units does the power transmission comprise?
6. What assemblies does the running gear consist of?
7. What has the body?

Exercise 6. Match the beginnings of the sentences (1-7) with the appropriate endings (a-g).

1. The automobile is made up of...	a. a power transmission, running gear, steering and braking systems.
2. The engine is...	b. the clutch, gearbox, propeller shaft, final drive, differential and axle shafts.
3. The engine includes...	c. a hood, fenders and accessories.
4. The chassis consists of...	d. the engine, the chassis and the body.
5. The power transmission comprises...	e. a frame with axles, wheels and springs.
6. The running gear consists of...	f. the source of power.
7. The body has...	g. fuel, cooling, electric and lubricating systems.

Exercise 7. Find and write down English equivalents to the following sentences in Russian.

1. Автомобиль состоит из трех основных частей: двигателя, шасси и кузова. 2. Двигатель – это источник энергии. 3. Двигатель включает в себя топливную, охлаждающую, смазывающую и электрическую системы. 4. Шасси включает в себя силовую передачу, ходовую часть, рулевую и тормозную системы. 5. Силовая передача (трансмиссия), в свою очередь, состоит из сцепления, коробки передач, карданного вала, главной передачи, дифференциала, заднего моста и полуосей. 6. Ходовая часть включает в себя раму с осями, колеса и рессоры. 7. Кузов включает в себя капот, крылья и вспомогательные аксессуары: отопитель, стеклоочистители, магнито-лу, кондиционер и т. п.

Exercise 8. Read and translate the dialogue.

A: Do you know what parts the automobile is made up of?

B: Certainly. It is made up of the engine, the chassis and the body.

A: What is the source of power?

B: The source of power is the engine. It includes fuel, cooling, lubricating and electric systems.

A: And what does the chassis consist of?

B: It consists of a power transmission, running gear, steering and braking systems. By the way, the power transmission, in turn, comprises the clutch, gearbox, propeller shaft, final drive, differential, rear axle and axle shafts.

A: And what has the body?

B: The body has a hood, fenders and accessories, such as: the heater, stereo tape recorder, windshield wipers, conditioner and so on.

A: Thank you very much for your information.

B: Don't mention it. I am glad to help you.

Exercise 9. Find English equivalents to the following Russian words and word combinations.

Сделан из; шасси; кузов; включать в себя; топливная, охлаждающая, смазывающая и электрическая системы; трансмиссия; ходовая часть; рулевая и тормозная системы; карданный вал; главная передача; дифференциал; задний мост; полуоси; капот; крылья; вспомогательные устройства; стеклоочистители.

Exercise 10. Complete the sentences in the dialogue below with the words and word combinations given in the box.

Engine, chassis, body, power train, running gear, steering system, brakes, clutch, gearbox, propeller shaft, final drive, differential, rear axle, axle shafts, hood and fenders, heater, windshield wipers, information, conditioner, consist(s) of, the source of power, include, fuel, cooling, lubricating, electric systems.

A: What parts does the automobile...?

B: It is made up of...

A: What is...?

B: The source of power is the...

A: What systems does the engine...?

B: It includes...

A: What does the chassis...?

B: The chassis...

A: What does the power train include?

B: The power train includes...

A: What units does the body comprise?

B: It comprises... and accessories such as...

A: Thank you for your...

Exercise 11. Act the dialogue.

Exercise 12. Answer the questions.

1. What main parts is the automobile made up of?

2. What is the function of the engine?

3. What systems does the engine include?

4. What does the chassis consist of?
5. What units does the power transmission comprise?
6. What assemblies does the running gear consist of?
7. What has the body?

Exercise 13. Match the descriptions of the mechanisms (1-6) with the appropriate component of the automobile (a-h). There are some extra components.

a) clutch; b) brakes; c) gearbox; d) steering system; e) heater; f) windscreen; g) speedometer; h) tachometer

1. Mechanism which is used to stop the car.
2. Mechanism which is used to guide the car.
3. Mechanism which engages or disengages the engine and the car wheels.
4. Mechanism which is used to change the speed of the car.
5. Mechanism which is used to guide the car in one or the other directions.
6. Device which is designed to measure the speed of the car.

Exercise 14. Give a summary of the text using the answers to the questions in Exercise 12.

Exercise 15. 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. INTERNAL COMBUSTION ENGINE

Источник: Шляхова А.В. Английский язык для студентов автомобилестроительных специальностей средних профессиональных учебных заведений: учебное пособие / В.А. Шляхова. – Москва: Высшая школа, 2008. – 120 с.

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

1. bottom dead center нижняя мертвая точка
2. charge of fuel заряд топлива
3. combustion сгорание
4. combustion chamber камера сгорания
5. compression stroke такт сжатия (смеси)
6. connecting rod шатун
7. crankshaft коленчатый вал
8. cylinder цилиндр
9. diesel engine дизельный двигатель
10. engine двигатель
11. exhaust stroke такт выпуска
12. four-stroke cycle четырехтактный цикл
13. fuel injection впрыск топлива
14. ignite воспламенять
15. ignition воспламенение
16. intake (inlet) stroke такт впуска
17. internal combustion engine двигатель внутреннего сгорания
18. mixture смесь
19. operating cycle рабочий цикл

20. petrol engine бензиновый двигатель
21. piston поршень
22. power stroke рабочий ход
23. pressure давление
24. reciprocating movement возвратно-поступательное движение
25. residual gas остаточный газ
26. rotary movement вращательное движение
27. spark plug свеча зажигания
28. stroke ход (поршня)
29. top dead center верхняя мертвая точка
30. valve клапан

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

Principle, cycle, piston, center, cylinder, atmosphere.

Exercise 3. Translate the sentences into Russian using the words and word combination from Exercise 1.

1. During the inlet (intake) stroke the inlet valve opens and a charge of fuel (mixture) flows into the cylinder. 2. During the compression stroke the inlet valve is closed and the fuel is compressed by the rising piston. 3. During the power stroke both valves are closed, pressure rises in the combustion chamber, and the spark ignites the mixture. 4. During the exhaust stroke the exhaust valve is opened, pressure is released and the residual gases flow into the atmosphere through the exhaust valve.

Exercise 4. Read and translate the text.

The Internal Combustion Engine

The internal combustion engine is called so because fuel is burned directly inside the engine itself. Most automobile engines work on a 4-stroke cycle. A cycle is one complete sequence of 4 strokes of the piston in the cylinder. The operating cycle of the four-stroke petrol engine includes: inlet stroke (intake valve opens), compression stroke (both valves closed), power stroke (both valves closed), exhaust stroke (exhaust valve is opened).

To describe the complete cycle, let's assume that the piston is at the top of the stroke (top dead center) and the inlet and the exhaust valves are closed. When the piston moves down the inlet valve opens to intake a charge of fuel into the cylinder. This is called the inlet (intake) stroke. On reaching the lowest position (bottom dead center) the piston begins to move upward into the closed upper part on the cylinder, the inlet valve is closed and the mixture is compressed by the rising piston. This is called the compression stroke. As the piston again reaches the top dead center the spark plugs ignite the mixture, both valves being closed during its combustion. As a result of burning mixtures the both valves being closed during its combustion. As a result of burning mixtures the gases expand and great pressure makes the piston move back down the cylinder. This stroke is called the power stroke. When the piston reaches the bottom of its stroke, the exhaust valve is opened, pressure is released, and the piston again rises. It lets the burnt gas flow through the exhaust valve into the atmosphere. This is called the exhaust stroke which completes the cycle. So, the piston moves in the cylinder down (intake stroke), up (compression stroke), down (power stroke), up (exhaust stroke).

The heat released by the fuel is transformed into work so that the reciprocating movement of the pistons is converted into rotary movement of a crankshaft by means of connecting rods.

Exercise 5. Read the questions (1-6) and the answers to them. Choose the appropriate option (a-b) to complete the answers.

1. Why is the engine called the internal combustion engine?

It is called so because the fuel (the mixture) is burned...

- a. directly inside the engine.
- b. outside the engine.

2. What stroke is called the inlet one?

The inlet stroke is called so because during moving down the piston...

- a. the inlet valve opens to intake a charge of fuel into the cylinder.
- b. the inlet valve is closed and the mixture is compressed.

3. What is a compression stroke?

The compression stroke is a stroke...

- a. when the inlet valve opens to intake a charge of fuel into the cylinder.
- b. when the inlet valve is closed and the mixture is compressed.

4. What takes place in the cylinder on power stroke?

On power stroke...

- a. the spark plugs ignite the mixture, both valves are closed during its combustion.
- b. the exhaust valve is opened and the residual gas flows through the exhaust valve into the atmosphere.

5. What takes place on the exhaust stroke?

On the exhaust stroke...

- a. the spark plugs ignite the mixture, both valves are closed during its combustion.
- b. the exhaust valve is opened and the residual gas flows through the exhaust valve into the atmosphere.

6. By means of what is the reciprocating movement of the pistons converted into rotary movement of a crankshaft?

It is done...

- a. by means of pistons.
- b. by means of the connecting rods.

Exercise 6. Read and translate the dialogue 'Tracing a Fault'.

Nick: Peter, I know you are a good driver. I would like you to have a look at my car.

Peter: What's wrong with your car?

N.: I don't know.

P.: Let me have a look. When did you have your plugs checked?

N.: Three days ago. I thought I had run out of fuel but the tank is half full.

P.: The carburettor is in order but the engine is misfiring. I guess the battery has run down. It needs recharging.

N.: Too bad.

P.: Don't get upset about it. It won't take you long to have your battery recharged.

N.: Do you really think so?

P.: I am sure of it. I advise you to have the engine greased.

N.: I'll follow your advice. Thank you, Peter.

P.: Don't mention it, Nick. I'm very sorry I couldn't help you.

N.: Well, you helped me to find the fault. Thanks a lot. Good-bye.

P.: See you later.

Exercise 7. Read the dialogues and translate the phrases in Russian into English.

Then, act out the dialogues.

1. – Не знаю, что случилось с моей машиной.

– Let me trace the fault.

– Пожалуйста. Ты опытный водитель?

– Yes, I am. I have been driving a car for fifteen years now. Maybe you have run out of fuel?

– Бак почти полный.

– When did you have your plugs checked?

– Вчера. Карбюратор тоже в порядке.

– В таком случае давай поедem до ближайшей ремонтной станции.

– Good idea. They will have the car fixed.

2. – Когда тебе починили машину?

– Last month. The engine is in good condition now. It was well greased.

– Хорошо. Мне тоже надо чинить машину. The brakes are slack. The battery has run down.

– It can be easily done.

– Я рад это слышать.

3. – Какую машину ты хочешь купить?

– I want a second-hand car. Could you help me?

– С большим удовольствием.

– I've heard there are good cars on sale 42nd Street.

– Я знаю этот магазин. Давай поедem туда.

– Good idea. If I choose a car there, I won't have to bother any more.

– Совершенно верно.

Exercise 8. Read and translate the dialogue 'At the Repairing Shop'. Act it with a partner.

Client: Good afternoon! Can you help me? There is something wrong with the engine.

Master: Hi! What's wrong with it?

C.: I don't know. It wouldn't start. Maybe the pistons and valves are in disorder.

M.: Let's have a look! Well, they are quite right.

C.: And what about the crankshaft, or electric spark plug. I know absolutely nothing about the operating cycle of the engine.

M.: Just a moment. Don't worry! We shall check-up all units and how they work together. My God! There is no petrol in the tank. How can you move drive?

C.: Really? Oh, I have forgotten to fill in the tank! I beg your pardon to trouble you!

M.: No trouble at all. You are welcome!

Exercise 9. Give a summary of the text.

Exercise 10. 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. CHASSIS

Источник: Шляхова А.В. Английский язык для студентов автомобилестроительных специальностей средних профессиональных учебных заведений: учебное пособие / В.А. Шляхова. – Москва: Высшая школа, 2008. – 120 с.

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

1. unit узел, блок, агрегат
2. gear шестерня
3. power transmission силовая передача
4. gearbox коробка передач
5. tractive effort тяговое усилие
6. running gear ходовая часть
7. driving wheels ведущие колеса
8. steering system система рулевого управления
9. shaft вал
10. car springs рессоры автомобиля
11. flywheel маховик
12. rear axle задний мост
13. clutch сцепление
14. final drive главная передача
15. friction device фрикционное устройство
16. axle shafts полуоси
17. crankshaft коленчатый вал
18. brakes тормоза

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

Transmission, system, mechanism, radiator, friction, automobile, cardan, portion, final, accelerator, pedal, position.

Exercise 3. Translate the sentences into Russian using the words and word combination from Exercise 1.

1. The chassis includes the running gear, the power transmission and the steering mechanism. 2. The power transmission consists of the clutch, gearbox, cardan shaft, rear axle, final drive, differential and axle shafts. 3. The clutch connects the engine with the driving wheels. 4. The gearbox changes the speed of the car movement. 5. The steering mechanism changes the direction of the car.

Exercise 4. Read and translate the text.

Chassis

The main units of the chassis are: the power transmission, the running gear and the steering mechanism.

The power transmission includes the whole mechanism between the engine and the rear wheels. This entire mechanism consists of the clutch, gearbox, propeller (cardan) shaft, rear axle, final drive, differential and axle shafts. At the front end of the car is the engine. On the back of it is the flywheel. Behind the flywheel is the clutch. The clutch is a friction device connecting the engine with the gears of the gearbox.

The main function of the gearbox is to change the speed of the car. The power is always transmitted by the cardan shaft to the live back axle. The final drive reduces the high speed of the engine to the low speed of the driving wheels. The differential enables the driving wheels to turn at different speeds which is necessary when turning the car.

The foundation of the automobile is the frame to which different chassis units are attached. The rear axle is capable of moving up and down about the frame. The rear axle is an important part of the transmission. It carries the greater portion of the weight of the car.

The steering mechanism is designed for changing the direction of the car. The brakes are used for stopping the car, for decreasing its speed and for holding the car position.

Exercise 5. Answer the questions to the text.

1. What main units does the chassis consist of?
2. Where is the engine located?
3. Where is the flywheel fixed?
4. Where is the clutch placed?
5. What is the gearbox designed for?
6. By what shaft is the power transmitted to the back axle?
7. What does the rear axle do?
8. What is the function of the differential?
9. What purpose is the steering system designed for?
10. What is the function of the brakes?

Exercise 6. Translate the sentences into English.

1. Основными узлами шасси являются: трансмиссия, ходовая часть и рулевой механизм. 2. Коробка передач предназначена для изменения скорости движения автомобиля. 3. Маховик крепится на задней части двигателя. 4. Сцепление соединяет двигатель с коробкой передач. 5. Радиатор расположен в передней части автомобиля. 6. Усилие передается карданным валом. 7. Главная передача снижает высокие обороты двигателя до невысоких оборотов ведущих колес. 8. Дифференциал позволяет ведущим колесам вращаться с разной скоростью при повороте автомобиля. 9. Рулевой механизм предназначен для изменения направления движения автомобиля. 10. Тормоза используются для остановки или снижения скорости автомобиля.

Exercise 7. Match the descriptions of the mechanisms (1-9) with the appropriate names for them (a-i).

1. differential	a. mechanism used to increase the speed of the car
2. steering wheel	b. wheel used to turn the direction of the car
3. clutch	c. mechanism used to transmit power to the back axle
4. rear axle	d. instrument used to measure the speed of the car
5. steering system	e. mechanism that slows or stops the car
6. speedometer	f. mechanism used to guide the car
7. brakes	g. mechanism used to engage or disengage the engine with gearbox
8. gearbox	h. mechanism used to carry the greater portion of the car weight
9. cardan shaft	i. mechanism used to turn the wheels at different speeds

Exercise 8. Read and translate the dialogue 'Transmission Mechanism'. Act it with a partner.

Teacher: Let's talk about the transmission mechanism. What main units does the transmission include?

Student: The transmission is the entire mechanism between the engine and the rear wheels. It includes the clutch, gearbox, cardan shaft, rear axle, final drive and differential.

T.: What does the clutch connect?

S.: The clutch connects the engine with the gearbox.

T.: And what does the gearbox do?

S.: The gearbox changes the speed of the car.

T.: What does the differential enable?

S.: The differential enables the driving wheels to move at different speeds when turning the car.

T.: For what purpose is the steering system used?

S.: The steering system is used for changing the direction of the car movement.

T.: And what is the function of the brakes?

S.: Brakes are used to slow or stop the car.

T.: That's right. You know the subject very well.

Exercise 9. Give a summary of the text.

Exercise 10. 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. FRAME

Источник: Шляхова А.В. Английский язык для студентов автомобилестроительных специальностей средних профессиональных учебных заведений: учебное пособие / В.А. Шляхова. – Москва: Высшая школа, 2008. – 120 с.

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

1. frame рама
2. twist кручение
3. support опора; поддерживать
4. suspension подвеска
5. body кузов
6. channel section полая секция
7. longitudinal members лонжероны
8. weld сваривать
9. cross members поперечины
10. rivet заклепывать
11. reinforce усиливать
12. insulate изолировать
13. rigid жесткий
14. rubber pad резиновая прокладка
15. mining прочный
16. unibody construction несущая/безрамная конструкция
17. withstand strains выдерживать нагрузки с несущим кузовом
18. strengthen укреплять
19. supporting structure опора, несущая/поддерживающая конструкция
20. body-on-frame рамный
21. static and dynamic load статическая и динамическая/ударная нагрузка
22. undue deflection or distortion чрезмерное отклонение или искажение
23. torsional twisting скручивание
24. transverse lateral forces поперечные боковые силы
25. longitudinal tensile forces продольные растягивающие усилия/силы
26. ladder type frame рама лестничного типа, лонжеронная рама

27. X-type frame X-образная рама
28. perimeter frame рама, совпадающая с периметром кузова автомобиля
29. unibody/unitized body несущий кузов

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

Chassis, structure, system, integral, construction, steel, vibration, passenger, metal, contact, motor, component, skeleton, organism, design, function, mechanical, static, dynamic, vertical, start, acceleration, type, perimeter, shock, term, plan, form, traditional, architecture.

Exercise 3. Read and translate the text.

Frame

The foundation of the automobile chassis is the frame which provides support for the engine, body and power-train members. Cross members reinforce the frame. The frame is rigid and strong so that it can withstand the shocks, vibrations, twists and other strains to which it is put on the road.

The frame provides a firm structure for the body, as well as a good point for the suspension system. There are two types of frames, namely: conventional frames and integral (unibody) frames (frameless constructions).

Conventional frames are usually made of heavy steel channel sections welded or riveted together. All other parts of the car are attached to the frame.

In order to prevent noise and vibrations from passing to the frame and from there to the passengers of the car, the frame is insulated from these parts by rubber pads. It is also important to insulate the frame in order to prevent metal-to-metal contacts.

Frameless (unibody) constructions are called so because they are made integral with the body. The body parts are used to structurally strengthen the entire car. Some unibody frames have partial front and rear frames for attaching the engine and suspension members.

Exercise 4. Find in the text English equivalents to the following Russian terms.

Лонжероны, поперечины, жесткий, прочный, выдерживать нагрузки, подвеска, обычная (общепринятая) рама, безрамная конструкция, полые секции, сваренные или заклепанные, прикреплять к раме, резиновые прокладки, укреплять.

Exercise 5. Answer the questions to the text.

1. What does the frame provide?
2. Why is the frame rigid and strong?
3. What types of frames are there?
4. What is the conventional frame made of?
5. By what is the frame insulated from the other car parts? For what purpose?
6. What do you know about unibody frames?

Exercise 6. Match the beginnings of the sentences (1-5) with the appropriate endings (a-e).

1. The frame provides support for...	a. channel sections welded together.
2. Conventional frames are made of...	b. prevent noise and vibrations from passing to the passengers.
3. Frameless constructions are made...	c. cross members.
4. The frame is insulated from other parts in order to...	d. the engine, body and power train members.
5. The frame is reinforced by...	e. integral with the body.

Exercise 7. Read one more text about the frame and translate it into Russian using the wordlist from Exercise 1.

Vehicle Frame

Источник: https://ultimatepopculture.fandom.com/wiki/Vehicle_frame

A vehicle frame, also known as its chassis, is the main supporting structure of a motor vehicle, to which all other components are attached, comparable to the skeleton of an organism.

Until the 1930s virtually every car had a structural frame, separate from its body. This construction design is known as body-on-frame. Over time, nearly all passenger cars have migrated to unibody construction, meaning their chassis and bodywork have been integrated into one another.

Nearly all trucks, buses, and most pickups continue to use a separate frame as their chassis.

The main functions of a frame in motor vehicles are:

1. To support the vehicle's mechanical components and body.
2. To deal with static and dynamic loads, without undue deflection or distortion.

These include:

- Weight of the body, passengers, and cargo loads.
- Vertical and torsional twisting transmitted by going over uneven surfaces.
- Transverse lateral forces caused by road conditions, side wind, and steering the vehicle.
- Torque from the engine and transmission.
- Longitudinal tensile forces from starting and acceleration, as well as compression from braking.
- Sudden impacts from collisions.

Types of frame according to the construction are a ladder type frame, an X-type frame, an off-set frame, an off-set with cross member frame and a perimeter frame. Cross members reinforce the frame. The frame is rigid and strong so that it can withstand the shocks, vibrations, twists and other strains to which it is put on the road.

The term unibody or unit body is short for unitized body. It is a type of construction in which the body of the vehicle, its floor plan and chassis form a single structure. Such a design is generally lighter and more rigid than a vehicle having a separate body and frame.

Traditional body-on-frame architecture has shifted to the lighter unitized body structure that is now used on most cars.

Exercise 8. Translate the sentences into English.

1. Рама обеспечивает опору для кузова, двигателя и узлов силовой передачи. 2. Она состоит из лонжеронов и поперечин, которые усиливают раму. 3. Рама должна выдерживать вибрацию, кручения и другие нагрузки (напряжения). 4. Рамы бывают двух типов: обычные (стандартные) и выполненные воедино с кузовом. 5. Стандартные рамы изготовлены из стальных полых секций, сваренных или заклепанных вместе. 6. Безрамные конструкции выполнены воедино с кузовом. 7. Рама изолируется от кузова резиновыми прокладками, чтобы шумы и вибрации не проходили к пассажирам автомобиля.

Exercise 9. Read and memorize the words and word combinations to the dialogue below.

1. seen you for ages не видел тебя сто лет
2. perfectly well прекрасно
3. get into trouble попасть в беду

4. be wrong with что-то не так
5. sure конечно (без сомнения)
6. find out the damage отыскать повреждение
7. cope with справиться (с проблемой)

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

Stas: Hi! Seen you for ages! How are you?

Vlad: Hi! I'm perfectly well! I am working at a repairing shop. Very interesting I can tell you.

S.: What are you doing there?

V.: Now, we are testing the frame. You see, the driver has got into trouble. Something is wrong with his car. He thinks it is the frame.

S.: Has the car a conventional or unibody frame?

V.: Unibody frame.

S.: I think you have to do a lot of work as body parts strengthen the entire car.

V.: Sure. We are testing all parts in order to find out the damage.

S.: I think you will cope with the problem.

Exercise 11. Give a summary of one of the texts.

Exercise 12. 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. CLUTCH

Источник: Шляхова А.В. Английский язык для студентов автомобилестроительных специальностей средних профессиональных учебных заведений: учебное пособие / В.А. Шляхова. – Москва: Высшая школа, 2008. – 120 с.

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

1. friction device фрикционное устройство
2. pressure plate (disc) нажимной диск (сцепления)
3. hard-wearing material износостойкий материал
4. connect соединять
5. gearbox коробка передач
6. frictional force сила трения
7. start the car завести автомобиль
8. clutch сцепление
9. clutch pedal педаль сцепления
10. release the engine отсоединить двигатель
11. be at rest быть в исходном положении (в покое)
12. be engaged быть включенным
13. fix крепить (устанавливать)
14. flywheel маховик
15. be disengaged быть отключенным
16. friction disc (plate) фрикционный (ведомый) диск (сцепления)
17. run idly работать вхолостую
18. car wheels колеса автомобиля
19. control управлять

20. disconnect отсоединять
21. frictional force сила трения
22. gear шестерня, передача
23. press down the pedal нажимать на педаль
24. principle of operation принцип действия
25. running engine работающий двигатель
26. manual transmission механическая коробка передач
27. left-most pedal крайняя левая педаль
28. cable connection соединение проводов
29. mechanical linkage механическое сцепление
30. remote means средство дистанционного управления
31. take up включать
32. default state по умолчанию
33. spin быстро вращать(ся)
34. input shaft входной вал
35. engagement dogs собачки зацепления
36. gearbox output shaft вторичный вал коробки передач
37. slip проскальзывать
38. driving plate of the clutch приводная пластина сцепления
39. clutch housing картер сцепления
40. rear-wheel drive car заднеприводный легковой автомобиль

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

Start, disc, friction, frictional, material, base, principal, control, pedal, modern, transmission, cable, mechanism, operate, physically, effect, vibration, design, mechanical, default, press, neutral, locate, permanently, final, result, typical, diameter, disk.

Exercise 3. Read and translate the text.

Clutch

The clutch is a friction device. It connects the engine to the gears in the gearbox. It is used for disconnecting the engine from the gearbox, for starting the car and for releasing the engine from the car wheels.

The clutch is fixed between the flywheel of the engine and the gearbox and consists of two plates (discs): the friction disc and the pressure disc. The friction disc is situated between the flywheel and the pressure plate and has a hard-wearing material on each side.

The basic operation principle of the clutch is frictional force acting between two discs. The clutch is controlled by the clutch pedal. When the pedal is at rest the clutch is engaged and the running engine is connected to the gearbox. When the pedal is pressed down the clutch is disengaged and the engine runs idly.

Exercise 4. Find Russian equivalents to the following words and word combinations from the text.

Friction device, clutch, gearbox, to free, to start, to release, flywheel, pressure plate, basic principle of operation, to fix, hard-wearing material, to consist of, to be controlled by, running engine, to run idly, to engage, to disengage, to press down, to be at rest.

Exercise 5. Answer the questions to the text.

1. What device is the clutch?
2. What units does it connect?

3. What is the clutch used for?
4. Where is the clutch placed?
5. What plates does the clutch consist of?
6. What is the basic operation principle of the clutch?
7. What is the clutch controlled by?
8. What takes place when the clutch pedal is at rest?
9. When does the engine run idly?

Exercise 6. Choose the appropriate option (a, b, c) to complete the sentences (1-5).

1. The clutch is a device connecting...
 - a. the rear axle and axle shafts.
 - b. the gearbox and differential.
 - c. the engine and the gearbox.
2. The clutch is situated between...
 - a. the gearbox and cardan shaft.
 - b. the flywheel and the gearbox.
 - c. the gearbox and rear axle.
3. The clutch is controlled by...
 - a. the brake pedal.
 - b. the clutch pedal.
 - c. the gearbox and rear axle.
4. The clutch is engaged...
 - a. when the clutch pedal is pressed down.
 - b. when the clutch pedal is at rest.
5. The clutch is disengaged...
 - a. when the clutch pedal is at rest.
 - b. when the clutch pedal is pressed down.

Exercise 7. Read one more text about the clutch and translate it into Russian using the wordlist from Exercise 1.

Automobile Powertrain

Источник: <https://gaukmotors.co.uk/post/clutch>

In a modern car with a manual transmission the clutch is operated by the left-most pedal using a hydraulic or cable connection from the pedal to the clutch mechanism. On older cars the clutch might be operated by a mechanical linkage. Even though the clutch may physically be located very close to the pedal, such remote means of actuation are necessary to eliminate the effect of vibrations and slight engine movement, engine mountings being flexible by design. With a rigid mechanical linkage, smooth engagement would be near-impossible because engine movement inevitably occurs as the drive is 'taken up'.

The default state of the clutch is engaged – that is the connection between engine and gearbox is always 'on' unless the driver presses the pedal and disengages it. If the engine is running with the clutch engaged and the transmission in neutral, the engine spins the input shaft of the transmission but power is not transmitted to the wheels.

The clutch is located between the engine and the gearbox, as disengaging it is usually required to change gear. Although the gearbox does not stop rotating during a gear change, there is no torque transmitted through it, thus less friction between gears and their engagement dogs. The output shaft of the gearbox is permanently connected to the final drive, then the wheels, and so both always rotate together, at a fixed speed ratio. With the clutch disengaged, the gearbox input shaft is free to change its speed as the internal ratio is

changed. Any resulting difference in speed between the engine and gearbox is evened out as the clutch slips slightly during re-engagement.

Clutches in typical cars are mounted directly to the face of the engine's flywheel, as this already provides a convenient large diameter steel disk that can act as one driving plate of the clutch. Some racing clutches use small multi-plate disk packs that are not part of the flywheel. Both clutch and flywheel are enclosed in a conical clutch housing, which (in a rear-wheel drive car) usually forms the main mounting for the gearbox.

Exercise 8. Read and translate the dialogue. Act it out with a partner.

A: What is the function of the clutch?

B: You see, it serves three functions. It is used for freeing the engine from the gearbox, for starting the car and for freeing the engine from car wheels.

A: Is it a friction device?

B: Yes, of course. It is fixed between the flywheel of the engine and the gearbox and usually consists of two discs.

A: What discs?

B: The friction disc (driven disc) and the pressure disc.

A: I suppose the principle of operation of clutches is a frictional force between discs. Am I right?

B: Yes, you are. When the clutch is fully engaged the frictional force makes discs rotate at the same speed.

A: And by what is the clutch controlled?

B: By the clutch pedal. When it is at rest the clutch is engaged and when it is pressed down the clutch is disengaged and the engine is disconnected from the car wheels.

A: Thank you. And what types of clutches do you know?

B: Positive clutches and gradual engagement clutches.

A: Thank you very much for your information.

B: Not at all. Glad to help you.

Exercise 9. Find in the dialogue English equivalents to the following Russian terms. Write them down.

Функция сцепления, для отключения двигателя от коробки передач, крепится между маховиком и коробкой передач, фрикционный (ведомый) диск, нажимной диск, фрикционная сила, сцепление включено, педаль в исходном положении, педаль сцепления нажата.

Exercise 10. Match the words and word combinations in English (1-16) with their equivalents in Russian (a-p).

1. a friction device	a. завести автомобиль
2. gearbox	b. фрикционный диск
3. to start the car	c. маховик
4. to release the engine	d. износостойкий материал
5. is fixed	e. работать вхолостую
6. flywheel	f. соединяться
7. the friction disc	g. сила трения
8. the pressure disc	h. разъединяться
9. hard-wearing material	i. фрикционное устройство
10. frictional force	j. находиться в покое
11. the clutch pedal	k. закреплен

12. to be engaged	l. педаль сцепления
13. to be at rest	m. нажать на педаль
14. to be disengaged	n. отсоединить двигатель
15. to press down on the pedal	o. нажимной диск
16. to run idly	p. коробка передач

Exercise 11. Complete the sentences in the dialogue below with the words and word combinations given in the box.

Freeing the engine from the gearbox, serve, fixed, gearbox, controlled, starting the car, freeing the engine from the car wheels, pedal, at rest, engaged, disengaged, do, located.

A: What three functions does the clutch...?

B: It is used for...

A: Where is it...?

B: It is ... between the flywheel of the engine and the...

A: By what is the clutch...?

B: It is ... by the ...

A: What takes place when the pedal is...?

B: The clutch is...

A: And when the driver pushes down on the pedal?

B: The clutch is...

Exercise 12. Translate the following sentences into English.

1. Сцепление – это фрикционное устройство. 2. Сцепление соединяет двигатель и коробку передач. 3. Сцепление расположено между маховиком двигателя и коробкой передач. 4. Как правило, сцепление состоит из двух дисков: ведомого и нажимного. 5. Сцепление управляется педалью сцепления. 6. Когда педаль сцепления находится в покое, диски сцепления соединены и работающий двигатель соединен с коробкой передач и колесами. 7. Когда водитель нажимает на педаль сцепления, диски отходят, сцепление отсоединяется и двигатель работает вхолостую.

Exercise 13. Give a summary of one of the texts.

Exercise 14. 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. GEARBOX

Источник: Шляхова А.В. Английский язык для студентов автомобилестроительных специальностей средних профессиональных учебных заведений: Учебное пособие / В.А. Шляхова. – Москва: Высшая школа, 2008. – 120 с.

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

1. gear шестерня, передача
2. gearbox коробка передач
3. gearing зубчатое соединение
4. road conditions дорожные условия
5. forward speed передняя скорость
6. reverse drive обратный (задний) ход
7. low gear первая передача

8. top gear четвертая (прямая) передача
9. sliding-mesh gearbox коробка передач со скользящими шестернями
10. constant-mesh gearbox коробка передач с постоянным зацеплением шестерен
11. epicyclic (planetary) gearbox эпициклическая (планетарная) коробка передач
12. ordinary gearing стандартное зубчатое соединение
13. characteristic feature характерная особенность
14. fixed axes зафиксированные (неподвижные) оси
15. rotate bodily вращаться корпусом
16. axis ось
17. axle вал
18. secure обеспечить
19. shifting переключение
20. in direct line важно
21. breather channel канал сапуна
22. assemble собирать
23. disassemble разбирать
24. drain hole сливное отверстие
25. gearbox casing картер коробки передач
26. lubrication смазка
27. oil level уровень масла
28. repairing shop (workshop) ремонтная мастерская
29. shifting переключение
30. thin oil легкое масло
31. torque outputs выходной крутящийся момент
32. vehicular относящийся к машине, автотранспортное средство
33. parking pawl упор шестерни блокиратора коробки передач
34. forklift автопогрузчик, вилчатый подъёмник
35. lawn mower косилка для газонов и приусадебных участков
36. torque converter гидротрансформатор крутящего момента
37. hydraulic гидравлический
38. automatic transmission автоматическая коробка передач

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

Principal, function, construction, constructional, class, classify, type, planet, planetary, history, historical, stand, automatic, transmission, motor, system, popular, form, automobile, commercial, industrial, parking, machine.

Exercise 3. Read and translate the text.

Gearbox

The gearbox is placed between the clutch and the propeller shaft. The principal function of the gearbox is to vary the speed of the car movement to meet the road conditions. The gearbox provides four forward speeds and one reverse, as follows: 1. First or low gear; 2. Second gear; 3. Third gear; 4. Fourth or top gear; and 5. Reverse gear.

There are many constructional arrangements of gearboxes, which can be classified as follows: a sliding-mesh type, a constant-mesh type and an epicyclic (planetary) type.

The sliding-mesh type is the simplest one and is the oldest historically. The constant-mesh type is the most widely used type. They are termed 'ordinary' gearing, the characteristic feature of which is that the axes of the various gears are fixed axes. The gears simply rotate about their own axes. The characteristic feature of epicyclic (planetary) gearing is that one gear rotates about its own axis and also rotates bodily about some other axis.

To secure the several speeds of the car the clutch shaft is mounted in direct line with the gearbox shaft. The gearbox shaft carries on it the sliding gears which are used for shifting to secure the forward speeds and the reverse drive.

Exercise 4. Answer the questions to the text.

1. Where is the gearbox situated?
2. What is the function of the gearbox?
3. What speeds does the gearbox provide?
4. What types of gearboxes do you know?
5. Why is the clutch shaft mounted in direct line with the gearbox shaft?

Exercise 5. Match the beginnings of the sentences (1-5) with the appropriate endings (a-e).

1. The principal function of the gearbox is...	a. sliding-mesh type, constant mesh type and planetary type.
2. The gearbox provides...	b. the simplest one and historically oldest.
3. Gearbox can be...	c. to vary the speed of the car.
4. The sliding-mesh gearbox is...	d. four forward speeds and one reverse.
5. The constant-mesh gearbox is...	e. the most widely used.

Exercise 6. Translate the sentences into English.

1. Коробка передач предназначена для изменения скорости движения автомобиля. 2. Коробка передач обеспечивает четыре передние скорости и задний ход. 3. Самыми простыми являются коробки передач со скользящими шестернями. 4. Коробки передач могут быть со скользящими шестернями, с постоянным зацеплением шестерен и планетарного типа. 5. Скользящие шестерни на валу коробки передач используются для обеспечения передних скоростей и обратного хода. 6. Коробки передач с постоянным зацеплением шестерен используются наиболее часто.

Exercise 7. Translate the text into Russian using the wordlist from Exercise 1.

Gearboxes are assembled and disassembled on special stands using special mechanisms. In case of trouble in change-speed gearbox it can be repaired only in the workshop. But in order not to get into trouble you should do the followings steps: a. check the oil level in the gearbox casing; b. wash the breather channel; c. change the oil in accordance with the lubrication schedule; d. wash the gearbox with a thin mineral oil; e. drain the used oil through the drain hole.

Exercise 8. Read the text and translate it into Russian using the wordlist from Exercise 1.

Automatic Transmission

Источник: https://infogalactic.com/info/Automatic_transmission

An automatic transmission is a type of motor vehicle transmission that can automatically change gear ratios as the vehicle moves, freeing the driver from having to shift gears manually. Like other transmission systems on vehicles, it allows an internal combustion engine, best suited to run at a relatively high rotational speed, to provide a range of speed and torque outputs necessary for vehicular travel.

The most popular form found in automobiles is the hydraulic automatic transmission. Similar but larger devices are also used for heavy-duty commercial and industrial vehicles and equipment. This system uses a fluid coupling in place of a friction clutch, and accomplishes gear changes by hydraulically locking and unlocking a system of planetary gears.

These systems have a defined set of gear ranges, often with a parking pawl that locks the output shaft of the transmission to keep the vehicle from rolling either forward or backward. Some machines with limited speed ranges or fixed engine speeds, such as some forklifts and lawn mowers, only use a torque converter to provide a variable gearing of the engine to the wheels.

Exercise 9. Have a group discussion. Do you prefer driving cars with the automatic gearbox or manual gearbox? What are the advantages and disadvantages of the automatic gearbox?

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

Mike: Peter, do you remember what our teacher told us last time? What do you know about gearboxes?

Peter: I know that the gearbox is used to change the speed of the car.

M.: And how many speeds does the gearbox provide?

P.: It can provide four forward speeds and one reverse.

M.: Into what types are the gearboxes divided according to their arrangements?

P.: They are divided into sliding-mesh type, constant-mesh type and epicyclic type.

M.: What type is the simplest?

P.: The sliding-mesh one.

M.: Thank you very much for your help.

P.: You are welcome. Glad to help you.

Exercise 11. Give a summary of one of the texts.

Exercise 12. 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. BRAKE SYSTEM

Источник: Шляхова А.В. Английский язык для студентов автомобилестроительных специальностей средних профессиональных учебных заведений: учебное пособие / В.А. Шляхова. – Москва: Высшая школа, 2008. – 120 с.

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

1. brakes тормоза
2. performance работа
3. safety безопасность
4. depend зависеть
5. divide разделять
6. drum brakes барабанные тормоза
7. disk brakes дисковые тормоза
8. force the fluid подавать жидкость
9. under pressure под давлением
10. brakes are applied тормоза срабатывают
11. band brake ленточный тормоз
12. shoe brake колодочный тормоз
13. hydraulic assisted brakes тормоза с гидравлическим приводом
14. brake shoes колодки тормоза

15. brake fluid тормозная жидкость
16. master cylinder главный цилиндр
17. air brakes пневматические тормоза
18. brake drum тормозной барабан
19. braking effort тормозное усилие
20. common axle общая ось
21. control управление
22. foot brake ножной тормоз
23. force (cause) заставлять
24. hand brake ручной тормоз (стояночный)
25. leakage утечка
26. master cylinder главный цилиндр
27. proofness стойкость
28. release отпускать, разъединять
29. sticking заедание, прилипание
30. tightness герметичность
31. troubles неисправности
32. wheel cylinder колесный тормозной цилиндр
33. eddy-current brake тормоз на принципе вихревых токов
34. inhibit задерживать, тормозить
35. motion движение
36. friction трение
37. pressurized air/oil сжатый воздух, нагнетаемый воздух / масло, подаваемое под давлением
38. fin ребро
39. drag racing гонки с перегрузками
40. brake pad тормозная колодка

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

Mechanism, passenger, type, hydraulic, cylinder, vacuum, function, classify, classification, mechanical, electric, electromagnet, convert, kinetic, energy, potential, magnetic, disc, method, transform, form, rotate, parachute, airplane, baggage, automobile, pedal, brake, master, cylinder.

Exercise 3. Read and translate the text.

Car Brakes

Brakes are used to slow or stop the car where it is necessary. It is one of the most important mechanisms of the car as upon its proper performance the safety of passengers depends.

Car brakes can be divided into two types, namely: drum brakes and disc brakes. The drum type may be either a band brake or a shoe brake. Depending on their functions, the automobile has foot brakes and hand brakes (parking brakes).

According to their mode of operation, the brakes are classified as: mechanical brakes, hydraulic brakes, airbrakes, electric brakes. Brakes are controlled by the brake pedal.

Most braking systems in use today are hydraulic. This system consists of a master cylinder mounted on the car frame and wheel cylinders. When the driver pushes down on the brake pedal, it forces the piston to move in the master cylinder and brake fluid is delivered from it to the wheel cylinders. The piston movement causes brake shoes to move and the brakes are applied (the brake shoes are pressed against the brake drums).

The air brake uses compressed air to apply the braking force to the brake shoes. Electric brakes use electromagnets to provide the braking effort against the brake shoes.

Formerly brakes were applied only to the two rear wheels, but now all cars are equipped with all-wheels brakes. Today many improvements are being made in brakes.

Exercise 4. Find in the text English equivalents to the following Russian terms. Write them down.

Тормоза, безопасность пассажиров зависит от правильной работы тормозов, барабанные тормоза, дисковые тормоза, тормоза с усилителем, гидравлический привод тормозов, жидкость под давлением, тормоза срабатывают, тормозное усилие, нажать на тормозную педаль.

Exercise 5. Answer the questions to the text.

1. What is the function of the brakes?
2. What types are brakes divided into?
3. What brakes do you know according to their mode of operation?
4. What braking systems are used today?
5. By what are brakes controlled?
6. When are brakes applied?

Exercise 6. Match the words and word combinations in English (1-11) with their equivalents in Russian (a-k).

1. performance	a. зависеть от
2. the safety of passengers	b. барабанные тормоза
3. to depend upon	c. тормоза срабатывают
4. namely	d. тормоза с гидравлическим приводом
5. drum brakes	e. работа (действие)
6. disc brakes	f. именно
7. brakes are applied	g. тормоза с усилителем
8. hydraulic assisted brakes	h. под давлением
9. power assisted brakes	i. нажать на тормозную педаль
10. to press down on the brake pedal	j. дисковые тормоза
11. under pressure	k. безопасность пассажиров

Exercise 7. Match the beginnings of the sentences (1-5) with the appropriate endings (a-e).

1. Brakes are used for...	a. disc brakes and drum brakes.
2. Brakes are one of...	b. the driver pushes down on the pedal.
3. Brakes may be of two types:...	c. the brake pedal.
4. Brakes are applied by...	d. stopping the car.
5. Brakes are applied when...	e. the most important mechanism of the car.

Exercise 8. Translate the sentences into English.

1. Тормоза являются наиболее важным механизмом автомобиля. 2. На большинстве автомобилей используется гидравлический привод или пневматический привод. 3. Они используются для замедления движения или остановки автомобиля. 4. Тормоза можно разделить на два типа, а именно: барабанные тормоза и дисковые тормоза. 5. Тормоза срабатывают, когда водитель нажимает на тормозную педаль.

Exercise 9. Read one more text about brakes and translate it into Russian.

Brake

Источник: <https://en.m.wikipedia.org/wiki/Brake>

A brake is a mechanical device that inhibits motion by absorbing energy from a moving system. It is used for slowing or stopping a moving vehicle, wheel, axle, or to prevent its motion, most often accomplished by means of friction.

Most brakes commonly use friction between two surfaces pressed together to convert the kinetic energy of the moving object into heat, though other methods of energy conversion may be employed.

Other methods convert kinetic energy into potential energy in such stored forms as pressurized air or pressurized oil. Eddy current brakes use magnetic fields to convert kinetic energy into electric current in the brake disc, fin, or rail, which is converted into heat. Still other braking methods even transform kinetic energy into different forms, for example by transferring the energy to a rotating flywheel.

Brakes are generally applied to rotating axles or wheels, but may also take other forms such as the surface of a moving fluid (flaps deployed into water or air). Some vehicles use a combination of braking mechanisms, such as drag racing cars with both wheel brakes and a parachute, or airplanes with both wheel brakes and drag flaps raised into the air during landing.

Almost all wheeled vehicles have a brake of some sort. Even baggage carts and shopping carts may have them for use on a moving ramp.

Friction brakes on automobiles store braking heat in the drum brake or disc brake while braking then conduct it to the air gradually. When traveling downhill some vehicles can use their engines to brake.

When the brake pedal of a modern vehicle with hydraulic brakes is pushed against the master cylinder, ultimately a piston pushes the brake pad against the brake disc which slows the wheel down. On the brake drum it is similar as the cylinder pushes the brake shoes against the drum which also slows the wheel down.

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

Alex: Why are brakes used?

Boris: They are used to stop or to slow the car.

A.: Well, it is one of the most important mechanisms of the car, isn't it?

B.: Of course, the safety of the passengers depends upon their proper performance.

A.: What types of brakes are used today?

B.: Drum brakes, disk brakes and others.

A.: And in what way are they applied?

B.: They are applied by the brake pedal. When the driver pushes down on the pedal they are applied.

A.: Thank you. It was very nice of you to tell me this information.

B.: Don't mention it. I was glad to serve you.

Exercise 11. Make two stories – Clutch and Brakes, from these sentences. Write them down.

1. Brakes are the most important mechanism of the car. They are used to slow or stop the car where it is necessary. 2. The clutch is a friction device. It connects the engine to the wheels in the gearbox. It is used for freeing the engine from the gearbox, for starting the car and for releasing the engine from the car wheels. 3. It is fixed between the flywheel of the engine and the gearbox. 4. They are divided into two types, namely: drum brakes

and disc brakes. 5. Most cars of today use hydraulic or power assisted brakes. 6. They may be of two plates: a friction disc and a pressure disc. The friction disc is situated between the flywheel and the pressure disc.

Exercise 12. Translate the text into Russian.

Troubles in Braking System

The basic troubles of the braking system are as follows: 1. poor braking action; 2. sticking brake shoes which would not return to the initial position after a brake pedal is released; 3. non-uniform braking of the left and the right wheels on a common axle; 4. leakage of brake fluid and air leakage in the hydraulic brake; and 5. poor air tightness of the pneumatic brake control.

What to do:

1. Check the action of the foot and hand brakes and leak proofness of the brake hoses connections, components of the hydraulic and pneumatic controls of the brakes, as well as of the vacuum-power system.

2. Inspect the friction linings, wheel-brake springs, master and wheel cylinders of the hydraulic brake and the air compressor of the pneumatic brake using a test manometer to check it.

Exercise 13. Translate the sentences into English.

1. Тормоза используются для замедления движения или остановки автомобиля. 2. В зависимости от привода тормоза классифицируют на механические, гидравлические, пневматические и электрические. 3. Тормоза управляются тормозной педалью. 4. Тормоза срабатывают, когда водитель нажимает на тормозную педаль (тормозные колодки прижимаются к тормозным барабанам). 5. В пневматических тормозах для создания тормозного усилия используется сжатый воздух. 6. В электрических тормозах для создания тормозного усилия используется электромагнит. 7. В современных автомобилях используются тормоза с приводом на все колеса.

Exercise 14. Give a summary of one of the texts.

Exercise 15. 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. STEERING SYSTEM

Источник: Шляхова А.В. Английский язык для студентов автомобилестроительных специальностей средних профессиональных учебных заведений: учебное пособие / В.А. Шляхова. – Москва: Высшая школа, 2008. – 120 с.

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

1. guide the car управлять автомобилем
2. means of turning средство поворота
3. front wheels передние колеса
4. steering wheel рулевое колесо
5. steering column, steering mast рулевая колонка
6. for this purpose для этой цели
7. pivot шарнир
8. swing (swang, swung) поворачивать(ся)

9. steering knuckle arm, steering knuckle lever рычаг поворотного кулака
10. tie-rod поперечная тяга
11. pitman arm, steering arm, steering lever рулевая сошка
12. rack and pinion assembly рулевой механизм с рейкой и шестерней
13. ball joint шаровой шарнир
14. leverage рычажный механизм
15. hose шланг, рукав
16. steering gear рулевой механизм
17. recirculating ball steering рулевой механизм с шариковой гайкой
18. injury повреждение
19. steering box картер рулевого механизма
20. air bag подушка безопасности
21. bending изгиб
22. lever рычаг
23. linkage соединение
24. means of turning средство поворота
25. pitman shaft рулевой вал
26. rack and pinion type реечно-шестеренчатый механизм
27. steering knuckle поворотная цапфа, поворотный кулак
28. single tie-rod неразрезная поперечная рулевая тяга
29. drag link, steering gear connecting rod, steering drag rod продольная рулевая тяга
30. hydraulic power steering гидравлический усилитель руля
31. engine-driven pump насос с приводом от двигателя
32. electric power steering электрический усилитель руля
33. steering knuckle arm рычаг поворотного кулака, соединяемый с рулевой тягой; поворотный рычаг рулевого управления
34. tunable настраиваемый; регулируемый
35. pitman arm рулевая сошка, соединительная тяга
36. environmental hazard вредное воздействие на окружающую среду
37. leakage протекание, утечка
38. tie-rod поперечная рулевая тяга
39. power-assistance усиление
40. energy-absorbing steering column складывающаяся рулевая колонка (при ударе); травмобезопасная рулевая колонка

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

Column, system, hydraulic, pump, reservoir, popular, type, effective, energy, function, deformation, assist, assistance, electric, motor, preference, stop.

Exercise 3. Read and translate the text.

Steering System

To guide the car, it is necessary to have some means of turning the front wheels so that the car can be pointed in the direction the driver wants to go. The steering wheel in front of the driver is linked by gears and levers to the front wheels for this purpose. The front wheels are on pivots so they can be swung to the left or right. They are attached by steering knuckle arms to the rods. The tie-rods are, in turn, attached to the pitman arm.

When the steering wheel is turned, gearing in the steering gear assembly causes the pitman arm to turn to the left or right. This movement is carried by the tie-rods to the steering knuckle arms, and wheels, causing them to turn to the left or right.

The steering system incorporates: the steering wheel and column, steering gear, pitman arm, steering knuckle arm, front axle, steering, knuckle pivot, tie- rods. There are several different manual steering gears in current use, such as the rack and pinion type and the recirculating ball type. The rack and pinion steering gear is widely used.

Another manual steering gear which is popular in imported cars is the worm and sector type. The steering wheel and column are the source of injury to the driver, air bags and other devices being developed now to save the life of a driver.

Energy-absorbing columns must stop the steering wheel and column from being pushed to the rear as the front of the car is crushed in an impact.

Energy-absorbing columns must also provide the driver with a tolerable impact as he moves forward and strikes the wheel with his chest.

Exercise 4. Answer the questions to the text.

1. What mechanism is necessary to guide the car?
2. How is the steering wheel connected to the front wheels?
3. Why can the front wheels be swung to the left or to the right?
4. What does the manual steering system incorporate?
5. What types of manual steering gears in use do you know?

Exercise 5. Translate the text into Russian.

Troubles of Steering Gear Components

Steering gear and linkage may have the following basic troubles: excessive steering-wheel free play, bending of steering rod, oil leakage from the steering-gear case, disadjustment of steering gear.

What to do

1. Check the steering-wheel free play and steering gear performance while the car is running.
2. Check the steering-gear case for oil leakage by visual inspection.
3. Adjust the steering gear. Steering gear of the worm and roller type is adjusted by end playing in the steering worm shaft bearings.

Exercise 6. Match the beginnings of the sentences (1-6) with the appropriate endings (a-f).

1. The front wheels are on pivots so...	a. by the tie-rods.
2. When the steering wheel is turned...	b. rack and pinion type, recirculating ball type, worm and sector type.
3. The steering wheel is linked...	c. gearing in the steering system causes the pitman arm to turn.
4. Most manufacturers use...	d. rack and pinion type.
5. Steering gear may be...	e. they can be swung to the left or right.
6. Steering knuckle arms and wheels are turned...	f. by gears and levers to the front wheels.

Exercise 7. Translate the sentences into English.

1. Для управления автомобилем необходима система рулевого управления. 2. Рулевое управление включает в себя: рулевое колесо и рулевую колонку, зубчатое соединение, рулевую сошку, рычаги поворотного кулака и шарнирные соединения, рычаги и поперечные тяги. 3. Существуют различные типы рулевых механизмов, а именно: реечно-шестеренчатый тип, механизм с шаровой гайкой, механизм с червя-

ком и сектором. 4. Когда водитель поворачивает руль влево или вправо, то рулевой механизм заставляет рулевую сошку поворачиваться влево или вправо. Это движение передается поперечными тягами к рычагам поворотных кулаков и к колесам, заставляя их поворачиваться влево или вправо.

Exercise 8. Read one more text about steering system and translate it into Russian.

Four-Wheeler Steering Mechanisms

Источник: <https://yantrix.wordpress.com/2012/03/23/four-wheeler-steering-mechanisms/>

A hydraulic power steering (HPS) uses hydraulic pressure supplied by an engine-driven pump to assist the motion of turning the steering wheel.

Electric power steering (EPS) is more efficient than hydraulic power steering, since the electric power steering motor only needs to provide assistance when the steering wheel is turned, whereas the hydraulic pump must run constantly. In EPS, the amount of assistance is easily tunable to the vehicle type, road speed, and even driver preference.

An added benefit is the elimination of environmental hazard posed by leakage and disposal of hydraulic power steering fluid. In addition, electrical assistance is not lost when the engine fails or stalls, whereas hydraulic assistance stops working if the engine stops, making the steering doubly heavy as the driver must now turn not only the very heavy steering – without any help – but also the power-assistance system itself.

Exercise 9. Read and memorize the words and word combinations to the dialogue below.

1. look here послушай
2. troubles неисправности, неполадки
3. excessive free play чрезмерный свободный ход
4. check проверять
5. performance работа, характеристики
6. steering gear case картер коробки передач
7. anything else что еще
8. in this case в этом случае

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

Stas: Look here. I have some troubles with the steering system.

Vlad: What troubles?

S.: The first is excessive free play of the steering wheel.

V.: You should check free play of the steering wheel and steering gear performance.

S.: The second problem is oil leakage from the steering gear case.

V.: Check the steering gear case for oil leakage visually. Anything else?

S.: Sure. It is disadjustment of the steering gear. And I don't know what to do.

V.: You see, in this case it is better for you to go to a repairing shop. Good specialists should do this job.

S.: Thank you very much.

V.: Not at all.

Exercise 11. Give a summary of one of the texts.

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. ELECTRICAL EQUIPMENT: ELECTRICAL AND STARTING SYSTEMS

Exercise 1. Read and memorize the words and word combinations to Texts 1-2.

1. current ток
2. electrical equipment электрооборудование
3. ignition system система зажигания
4. ignite the fuel воспламенять топливо
5. lights фары
6. windscreen wipers стеклоочистители, «дворники»
7. heater подогреватель, отопитель, нагреватель
8. alternator альтернатор, генератор
9. troubleshooting поиск неисправности, диагностика, устранение неполадок
10. voltage вольтаж, электрическое напряжение
12. fuse предохранитель
13. charge заряд, заряжать
14. relay реле, переключатель
15. computer PCM (powertrain control module) компьютер управления АКПП
16. fusible link плавкая вставка/переходник; предохранительная линия
17. electrical connector штепсель; вилка; розетка; электрический соединитель; электрический разъём
18. electric starter motor электростартёр
19. starter pinion шестерня электростартёра
20. engine flywheel маховик двигателя
21. flywheel rim обод маховика; зубчатый венец маховика
22. electric current ток
23. wire провод
24. battery аккумулятор
25. hand-operated switch ручной выключатель
26. sparking искрение
27. circuit цепь (электрическая, гидравлическая); кольцо (трасса)

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

Operate, system, electricity, start, conditioner, voltmeter, component, stop, computer, problem, cylinder, electric, starter, motor, battery, solenoid, electromagnet.

Exercise 3. Read and translate Text 1.

Text 1. Electrical System

Источник: 'English for Car mechanics' Английский язык для автомехаников: учебно-методическое пособие по английскому языку. Р.В. Бичегкуева. – Иркутск: Государственное бюджетное профессиональное образовательное учреждение Иркутской области Иркутский техникум машиностроения им. Н.П. Трубецкого, 2021. – 52 с.

Every vehicle needs electricity to provide current for lights and other electrical equipment and to supply the necessary power for the ignition system. The electrical system is equipment in a car which provides electricity to start the engine, ignite the fuel, and operate the lights, windscreen wipers, heater and air conditioner.

One of the important components of an electrical system is the battery. The electrical system starts and stops with the battery. While the vehicle is operating the electrical system is energized and recharged by the alternator that is powered by the engine. When troubleshooting an electrical problem start with the battery.

By using a voltmeter determine if the battery has enough voltage to operate the electrical system.

There are dozens of electrical components related to the electrical system; most include one or more of the following: alternator, battery, fuse, switch, relay, computer PCM, fusible link, wire, and electrical connectors.

Exercise 4. Answer the questions to the text.

1. Why does any vehicle need electricity?
2. Why is the battery regarded an important component in the electrical system?
3. What device is used to determine the charge of the battery?
4. What components of the electric system do you know?

Exercise 5. Match the beginnings of the sentences (1-5) with the appropriate endings (a-e).

1. The electrical system provides electricity to...	a. check the battery first.
2. If there is an electrical problem in the car...	b. the electrical system.
3. While the vehicle is operating the electrical system is energized and recharged...	c. use a voltmeter.
4. The battery starts and stops...	d. operate the lights, air conditioner, heater and windscreen wipers.
5. When you need to determine if the battery has enough voltage,...	e. by the alternator that is powered by the engine.

Exercise 6. Read and translate Text 2.

Text 2. How the Starting System Works

Источник: <https://www.howacarworks.com/basics/how-the-starting-system-works>

To make an engine start it must be turned at some speed, so that it sucks fuel and air into the cylinders, and compresses it.

The powerful electric starter motor does the turning. Its shaft carries a small pinion (gear wheel) which engages with a large gear ring around the rim of the engine flywheel. In a front-engine layout, the starter is mounted low down near the back of the engine.

The starter needs a heavy electric current, which it draws through thick wires from the battery. No ordinary hand-operated switch could switch it on: it needs a large switch to handle the high current. The switch has to be turned on and off very quickly to avoid dangerous, damaging sparking. So, a solenoid is used – an arrangement where a small switch turns on an electromagnet to complete the circuit.

Exercise 7. Answer the questions to the text.

1. What should be done to make a vehicle's engine start?
2. How does the powerful electric starter motor function?
3. What does the starter require?
4. Why does the switch have to be turned on and off very fast?

Exercise 8. Read and translate the dialogue. Act it out with a partner.

Stas: Hi, Vlad!

Vlad: Hi, Stas! What are you searching the Web for?

S.: I am doing my homework for our English lesson tomorrow. I need to find the definitions in English for some terms. Can you help me, please?

V.: Yes, sure. What terms do you need to explain?

S.: The electrical system, automobile battery, alternator and ignition.

V.: Well. Let's start with the electrical system. Here it is. The electrical system is an equipment of a motor vehicle that provides electricity to start the engine, ignite the fuel, and operate the lights, windscreen wipers, heater and air conditioner.

S.: Fine. What about the automobile battery?

V.: As far as I know it's one of the important components in an electrical system. Look. It's written here that it's the heart of the car's electrical system. It is a lead-acid storage battery in a motor vehicle.

S.: And I've found the description of the alternator. Did you know that it's an old term for an electronic generator? It produces alternating current.

V.: And the last one is ignition. They say it's a mechanism that ignites the fuel in an internal-combustion engine.

S.: Thank you very much for your help.

V.: Not at all. Good luck!

Exercise 9. Give a summary of one of the texts.

Exercise 10. 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. ELECTRICAL EQUIPMENT: BATTERY

Exercise 1. Read and memorize the words and word combinations to Texts 1-2 about the vehicle's battery.

1. automotive battery автомобильный аккумулятор
2. rechargeable battery батарея аккумуляторов; перезаряжаемая батарея
3. SLI battery аккумулятор SLI (запуск, освещение, зажигание)
4. traction battery тяговая батарея
5. electric vehicle электромобиль
6. lead-acid storage battery свинцово-кислотная аккумуляторная батарея
7. current ток
8. voltage напряжение
9. be recharged подзарядка
10. maintain обслуживать
11. buzzing noise жужжание
12. hood капот
13. finite life span ограниченный срок службы
14. undercharging недостаточная зарядка
15. overcharging перезаряд
16. battery discharge warning предупреждение о разряде аккумулятора
17. screen экран
18. infotainment информационно-развлекательная система
19. information cluster информационная система поддержки водителя
20. repercussions последствия
21. Battery Saver Active function активная функция экономии заряда батареи
22. saver mode режим экономии заряда
23. electrical accessories электрические принадлежности
24. preserve сохранять
25. drain расходовать

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

Battery, type, electric, energy, automobile, starter, motor, system, chemical process, electrochemical, basis, test, regular, service, mechanic, chance, component, symptom, problem, degrade, information, active, function, accessories.

Exercise 3. Read and translate Text 1 using the wordlist from Exercise 9.

Text 1. Automotive Battery

Источник: <https://electricalencyclopedia.blogspot.com/2011/11/automotive-battery-working-principles.html>

Part 1

An automotive battery is a type of rechargeable battery that supplies electric energy to an automobile. Usually this refers to an SLI battery (starting, lighting, ignition) to power the starter motor, the lights, and the ignition system of a vehicle's engine. An automotive battery may also be a traction battery used for the main power source of an electric vehicle.

Part 2

A lead-acid storage battery is an electrochemical device that produces voltage and delivers electrical current. The battery is the primary 'source' of electrical energy used in vehicles today. It's important to remember that a battery does not store electricity, but rather it stores a series of chemicals, and through a chemical process electricity is produced. Basically, two different types of lead in an acid mixture react to produce an electrical pressure called voltage. This electrochemical reaction changes chemical energy to electrical energy and is the basis for all automotive batteries.

Part 3

Test your battery on a regular basis, including when you have your car serviced, before long trips or after it's been recharged. Maintain all areas/parts of your vehicle as directed in your owner's manual and/or by your mechanic. This will reduce the chance of other engine components draining power from your battery. It's not always the battery's fault when a car doesn't start, but often a symptom of other problems.

Part 4

There's nothing but a loud buzzing noise coming from under the hood when you try to start your car. It's time to pull some maintenance on the battery. Automotive batteries have a finite life span. Undercharging, overcharging and heat all team up to degrade your battery. Poor electrical connections make it more difficult for even a good battery to do its job.

Exercise 4. Match Parts 1-4 with the titles (a-d).

Part 1	a. Basic Battery Care
Part 2	b. Maintenance and Storage of Automotive Batteries
Part 3	c. An Automotive Battery
Part 4	d. Basics of a Lead-acid Storage Battery

Exercise 5. Translate the sentences into English.

1. Автомобильный аккумулятор – это тип перезаряжаемой батареи, которая снабжает автомобиль электрической энергией. 2. Аккумулятор является основным «источником» электрической энергии, используемой сегодня в транспортных средствах. 3. Свинцово-кислотная аккумуляторная батарея – это электрохимическое устройство, которое вырабатывает напряжение и подает электрический ток. 4. Регулярно проверяйте аккумулятор, в т. ч. во время техобслуживания автомобиля, перед

длительными поездками или после его подзарядки. 5. Когда автомобиль не заводится, это не всегда происходит по вине аккумулятора, но часто является признаком других проблем. 6. Автомобильные аккумуляторы имеют ограниченный срок службы. 7. Недостаточная зарядка, перезаряд и нагрев приводят к ухудшению состояния вашего аккумулятора.

Exercise 6. Answer the questions to the text.

1. What is an automotive battery?
2. What does a battery store?
3. What do you know about the basic battery care?
4. How do you know it's time to pull some maintenance on the battery?
5. What can degrade your battery?

Exercise 7. Read and translate Text 2 using the wordlist from Exercise 1.

Text 2. What Does Battery Discharge Warning Mean?

Источник: <https://mechanicask.com/battery-discharge-warning-meaning/>

The battery discharge warning means that your car's battery is getting discharged more than it is getting charged, indicating that your car might run into electrical problems soon. This warning will be displayed on either screen of your car, the infotainment, or the information cluster.

Battery discharge can have severe repercussions, whereas it can also be a symptom of something serious.

Some cars come with a Battery Saver Active function, which will put the vehicle in battery saver mode. This will turn off non-essential electrical accessories to preserve the battery.

Most of the time, a battery discharge warning will come up when the engine is off, and your car is still draining energy. However, sometimes, you might get this warning message while driving, indicating a more severe problem.

As to battery discharge warning message function, it may be rather irritating. Kia models are well known for getting the battery discharge warning message when using the radio or other electronic devices while stationary. While this is a good thing, the message can get the driver really annoyed as there is no way to turn it off.

Another popular car make that have this common problem is Hyundai. As reported on Hyundai Forums by multiple owners, most Hyundai models will alert you as soon as your engine is OFF and the air conditioning is running or listening to the radio.

Other popular automakers that have this issue include BMW, Ford, Honda and Toyota.

Exercise 8. What could cause battery discharge when the engine is off? Match the actions that can cause battery discharge (1-8) with their descriptions (a-h).

Источник: <https://mechanicask.com/battery-discharge-warning-meaning/>

1. Listening to the radio	a. Sometimes the battery discharge isn't in your control. Extreme weather is an act of nature. When it is too hot or too cold, it can harm the charging of the car's battery. Ideally, you should park your vehicle in a garage during the winter to prevent battery discharge from happening.
2. Loose terminals	b. An old battery is another cause of unusual battery discharge. The cells cycle of an aging battery is almost nearing the end. It can get discharged sooner than usual. As soon as you park the car, the battery will lose its charge.

3. Extreme weather	c. A parasitic drain is another possibility that could drain your battery. All things ranging from windscreen wipers, power windows, electronic steering, to power and heated seats are operated using electric current. So, a malfunction in any component can draw excessive current from the battery. This parasitic loss can lead to a more significant battery discharge.
4. Old battery	d. Many cars give a warning beep if you left the headlights on while leaving the car. Nobody can blame someone after a long workday if they forget to turn off the headlights. Headlights are the highest power-draining component in a car's electrical system so that they can discharge the battery very soon.
5. Chargers are left plugged in	e. Climate control is another system that draws power from the battery even when the engine is not running. The thing with climate control is that it is a necessity; you have to turn it on. But keeping it on for too long can discharge the battery rather quickly.
6. Parasitic drain	f. Features in cars are helping us, but they are also hurting us in some places. Charging ports are supplied in most modern cars. If you accidentally leave your mobile plugged in for charging while the engine is off, it will drain the battery, and eventually, the car will warn you.
7. Head lights are left on	g. When the car is parked, it is very common that we turn on the ignition switch and start listening to the radio. Mind you, that radio is an electrical device that draws power from the battery. Listening to the radio while the engine is off will cause your battery to drain.
8. Climate control is left on	h. Loose terminals are a battery killer. These terminals can result in loss of charge even when the car is not running. You should watch out for loose terminals if you want to avoid the inconvenience of your battery getting discharged.

Exercise 9. What could cause battery discharge when the car is running? Match the scenarios where you could get a battery discharge warning while driving (1-7) with their descriptions (a-g).

Источник: <https://mechanicask.com/battery-discharge-warning-meaning/>

1. Poor ground connection	a. The car's charging system consists of several components such as starter motors, alternators, and sensors. When any of these components aren't working correctly, your battery will be discharged sooner than expected.
2. Short drives	b. A worn-out serpentine belt reveals itself in the form of a drained battery. It is mainly responsible for providing power to the alternator, which then makes the current. If power is lost in slippage, the battery isn't charged correctly.
3. Faulty charging system	c. Ground connections play an important role in protecting the car against potential fires due to a short circuit. But a poor ground connection can cause your battery to discharge. The current flowing into the ground instead of charging the battery can be the reason.
4. Corroded battery terminals	d. A weak battery would not charge anyway. No matter how much you drive, even if the alternator and serpentine belt are working correctly, it would ultimately get drained.
5. Worn-out serpentine belt	e. Driving the car charges the battery; it is true. But short drives do the opposite of that. They don't give enough time for your car's battery to

	get charged. And if you use stereo or charging ports on this short drive, then it is most likely you will end up with a discharged battery.
6. Weak battery	f. An alternator is the main component of a car's charging system. If its life has ended, it won't function correctly. An alternator goes out after 80,000 miles and stops charging the battery.
7. Bad alternator	g. The physical condition of the battery is also important. If battery terminals are corroded or have a white deposit on their surface, then it won't allow the battery to charge. Even when the car is running, the battery will not receive any charge.

Exercise 10. Read the car mechanic's recommendations below and make a list of things you may do to fix a battery discharge.

Text 3. How Do You Fix a Battery Discharge?

Источник: <https://mechanicask.com/battery-discharge-warning-meaning/>

If your car battery is losing its charge, you can do a few things. By following the below guide, you can attempt to fix a battery discharge.

1. Check Electrolyte

The first and foremost step is to check the electrolyte levels. How many times it has happened that you didn't check electrolyte levels in the battery for months. It gets drained, and your car won't start. The cause being there is no electrolyte in the battery to supply current across terminals.

2. Jumpstart

Jumpstart is the oldest technique to put some life into a discharged battery. Take jump wires and connect your battery to a good battery. If you are lucky enough, the car will start, and once it starts, the alternator will recharge it again.

3. Get it Recharged

If nothing is working, then try to charge the battery externally. Multiple external DC (direct current) chargers are available in the market. Or you can visit a battery shop where they will charge it for \$10-20.

4. Replace the Battery

This is the last resort if nothing is working. You checked electrolyte; you tried to jumpstart it and tried charging it. The car starts, but the battery is drained as soon as you turn off the engine. Then it's time to get a new battery. When it is time to replace the battery, your Battery Warning light will come on as well, indicating there is a problem with your electrical system. This will cost you between \$45 to \$250, depending on the make and model of your car.

Exercise 11. Translate the sentences into English.

1. Первым и самым важным шагом является проверка уровня электролита. 2. Прикуривание – это самый старый метод, позволяющий продлить срок службы разряженного аккумулятора. 3. Если ничего не работает, попробуйте зарядить аккумулятор с помощью внешнего зарядного устройства постоянного тока. 4. Поменяйте ваш аккумулятор на новый, если он разряжается каждый раз, как только вы выключаете двигатель.

Exercise 12. Work in pairs, one of you is a car mechanic and the other is a client. Read the dialogue based on ideas from Text 3. Act it out.

Mechanic: Good morning! How can I help you?

Client: Morning! There is a problem with my car battery. It is constantly losing its charge.

M.: I see. Let's check electrolyte level first. Well, it's ok. Have you recharged it with an external DC charger?

C.: Yes, I have. The car starts, but the battery is drained as soon as I turn off the engine.

M.: Then I am afraid it's time to buy a new battery. I can recommend you a good battery shop.

C.: Thanks a lot!

M.: You're welcome.

Exercise 13. Give a summary of one of the texts.

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. ELECTRICAL EQUIPMENT: GENERATOR

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

1. generator генератор
2. automotive industry автомобильная промышленность
3. DC постоянный ток
4. maintenance обслуживание
5. reliability надёжность
6. provide power обеспечить питание (систем)
7. engine compartment моторный отсек
8. bracket кронштейн
9. engine block блок двигателя
10. drive belt приводной ремень
11. crankshaft pulley шкив коленчатого вала
12. storage battery аккумуляторная батарея
13. revolutions of the crankshaft обороты вращения коленчатого вала
13. voltage regulator регулятор напряжения
14. amount of output voltage величина выходного напряжения
15. power приводить в действие; питать
16. on-board network бортовая сеть автомобиля
17. charge заряжать
18. electromagnetic induction электромагнитная индукция
19. terminal вывод
20. stator winding обмотка статора
21. rotor ротор
22. bearing шариковый подшипник
23. crankshaft коленчатый вал
24. belt ремень; ременная передача
25. uneven неравномерный; неустойчивый; непостоянный
26. speed of rotation частота вращения
27. RPM (revolutions per minute) число оборотов в минуту
28. feed питать; осуществлять питание
29. excitation возбуждение; намагничивание током
30. voltage вольтаж, напряжение
31. output выход; мощность на выходе; выводной (контакт)

32. jumping скачкообразное изменение
33. unacceptable недопустимый, непозволительный, неприемлемый
34. stable voltage стабильное напряжение одинаковой величины
35. adjustable voltage регулируемое напряжение
36. relay regulator (релейный) регулятор напряжения
37. 'monitor' the voltage «регулировать» напряжение; поддерживать напряжение в определенных пределах
38. battery terminal вывод, полюс аккумуляторной батареи
39. current indicator индикатор тока
40. correct стабилизировать; вносить корректировки в напряжение
40. power supply питание; питающая сеть
41. upper allowable mark максимально допустимое значение
42. circuit цепь
43. resume возобновлять, продолжать (после перерыва); начинать снова
44. alternating three-phase voltage трёхфазное напряжение переменного тока; трёхфазное переменное напряжение
45. constant постоянный
46. rectifier bridge выпрямительный блок / диодный мост / выпрямитель
47. diode диод
48. mode of operation режим работы
49. warm up прогревать(ся)
50. discharged разряженный
51. recharge подзаряжать
52. emergency mode аварийный режим
53. maximum load максимальная нагрузка
54. turn on включать
55. energy consumers устройства, потребляющие ток; потребители
56. glass heaters обогреватели стекол
57. cabin салон (автомобиля)
58. malfunction сбой, неисправность
59. worn изношенный; истёртый
60. broken ослабленный, рваный, порвавшийся
61. poor contact плохой контакт
62. damage повреждение; дефект, поломка; неисправность
63. charging circuit зарядный контур
64. breakdown поломка; сбой
65. slip ring контактное кольцо
66. sparking искрение; искрообразование
67. voltage drop падение напряжения
68. drive belt приводной ремень
69. slippage проскальзывание; скольжение
70. tension натяжение
71. generator pulley шкив генератора
72. stretch терять эластичность, растягиваться, удлиняться
73. sag провисать; ослабевать
74. squeak визг, скрип; резкий звук
75. brush щётка (щёточного узла)
76. graphite графит; графитовый
77. natural wear-and-tear естественный износ

78. alternator генератор переменного тока
79. sharp increase резкое увеличение
80. dirt грязь
81. moisture влажность, сырость; влага
82. leaking oil протечка масла
83. oxidation окисление
84. 'mass' «масса»
85. undercharging разрядка ниже допустимого предела
86. stove печка, обогреватель
87. subwoofer отдельная низкочастотная колонка, низкочастотный динамик, сабвуфер
88. headlight фара (на передней части транспортного средства)

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

Generator, industry, battery, modern, compact, individual, production, technologies, mechanical, energy, electrical, function, system, start, starter, electricity, bracket, block, parallel, geometric, progression, regulator, control, sensor, operation, element, problem, maximum, recommend, climate, cabin, process, audio, result, designed, electromagnetic induction, rotor, voltage, stable, relay, indicator, correct, volt, stop, cycle, diode, graphite, symptom, voltmeter, phase, corrosion, mass.

Exercise 3. Read and translate the text.

Text 1. The Device and Principle of Operation of a Car Generator

Sources: <https://avtotachki.com/en/generator-avto>,
<https://a6s.info/en/electronics/151-generator-malfunctions>

The generator appeared in the automotive industry at the beginning of the 20th century along with the battery, which required constant recharging. These were huge DC nodes requiring constant maintenance. Modern generators have become compact, the high reliability of individual parts is due to the introduction of new production technologies.

Automobile generator is a unit that converts mechanical energy into electrical energy and performs the following functions:

- provides a constant and continuous battery charge when the engine is running;
- provides power to all systems during engine start, when the starter consumes a large amount of electricity.

The generator is installed in the engine compartment. Due to the brackets, it is attached to the engine block, driven by a drive belt from the crankshaft pulley. An electric generator is connected in an electrical circuit in parallel with the storage battery.

The battery is charged only when the generated electricity exceeds the battery voltage. The power of the generated current depends on the revolutions of the crankshaft, respectively, the voltage increases with the revolutions of the pulley with a geometric progression. To prevent overcharging, the generator is equipped with a voltage regulator that adjusts the amount of output voltage, providing 13.5-14.7V.

The car generator is designed and works as follows. Actually, the electricity used to power the on-board network and charge the battery is generated by electromagnetic induction. It is removed from the terminals of the stator windings, inside which the rotor rotates on two bearings. The rotor is driven by the crankshaft of the engine, to which it is connected by a belt.

The first feature that you need to know about is the uneven speed of rotation of the generator rotor. It depends entirely on what RPM the engine is running at. Accordingly, if

the rotor were fed (for excitation) with the same voltage, then at the output of the generator we would get a jumping voltage, which is unacceptable for the car's on-board network.

This problem is solved quite simply. The rotor is not supplied with a stable voltage, but an adjustable one. The relay regulator is responsible for this, which 'monitors' the voltage at the battery terminals, and, depending on the current indicators, corrects the power supply to the rotor. Roughly speaking, when the generator output voltage reaches the upper allowable mark (for example, 14.4 volts), the relay-regulator circuit stops powering the rotor. The output voltage drops, the rotor resumes excitation, and so on in a cycle with a very high frequency. Due to this, the voltage of the on-board network is constantly maintained at the same level, and does not depend on the speed at which the car's engine is running.

The second feature of the car generator is that it generates an alternating three-phase voltage. And to power the on-board network and charge the battery, it must be constant. To solve this problem, the generator is equipped with a rectifier bridge consisting of diodes. As a rule, the rectifier has six main diodes (two for each phase), as well as three additional ones.

Exercise 4. Answer the questions to the text.

1. What can you tell about modern generators?
2. What functions does automobile generator perform?
3. Where is the generator installed in a vehicle?
4. What does the power of the generated current depend on?
5. What is the voltage regulator used for?
6. What is the electricity used for on-board network and the battery generated by?
7. What is the rotor driven by?
8. What are the two features of the car generator?
9. What is a relay regulator used for?
10. Does the voltage of the on-board network depend on the speed of the car's engine?
11. Why is the generator equipped with a rectifier bridge?
12. How many diodes does the rectifier have?

Exercise 5. Read and translate Text 2 with the wordlist in Exercise 1.

Text 2. Why Does a Car Need a Generator?

Источник: <https://avtotachki.com/en/generator-avto>

In a modern car, almost every system is controlled by sensors that record their different modes of operation. If all these elements worked thanks to the battery charge, then the car would not even have time to warm up because the battery would be completely discharged. So, to solve this problem a generator is installed in a car. It works exclusively when the internal combustion engine is on and is needed to:

- Recharge the battery.
- Provide sufficient energy for each unit of the car's electrical system.
- Perform both functions in emergency mode or at maximum load – to feed the battery and provide energy to the vehicle's electrical system.

To prevent the battery from discharging while driving, it is not recommended to turn on many energy consumers at the same time. For example, in winter, some drivers turn on the car's climate system and glass heaters while warming up the cabin, and to make this process less boring they also switch on their powerful audio system. As a result, the generator does not have time to generate so much energy and it is partially taken from the battery.

Exercise 6. Mark the following sentences as True or False.

1. The generator provides all units of the car's electrical system with electric power.
2. The generator recharges the battery when the engine isn't running.
3. If a lot of energy consumers are switched on, the generator takes some energy from the battery.
4. When the load is at maximum, the generator can't feed the battery as well as supply energy to the vehicle's electrical system.

Exercise 7. Read a short list of typical generator faults (1-6). Match these malfunctions with their descriptions (a-f).

Information source: <https://a6s.info/en/electronics/151-generator-malfunctions>

1. Worn brushes	a. The slip rings are located on the generator rotor shaft. They are made of copper, and therefore wear out over time. The symptoms of this malfunction are exactly the same as in the case of brushes – sparking, voltage drops, as well as a complete failure of the generator.
2. Worn slip rings	b. Drive belt slippage can be caused by several reasons. Firstly, its insufficient tension. Secondly, getting water from puddles or engine oil on the generator pulley. Thirdly, the belt stretches over time, sags, and also begins to slip periodically. Very often, belt slippage is determined by the characteristic squeak that is heard when the engine starts, as well as immediately after turning on the load.
3. Slippage of drive belt	c. The most common failure associated with brushes is their natural wear-and-tear. When the graphite wears out, the brushes are simply not long enough to power the rotor. As a rule, this malfunction manifests itself in the form of abundant sparking inside the generator.
4. Broken drive belt	d. The primary symptom of a broken alternator belt is a warning light on the instrument panel, indicating that the battery is not charging. A secondary symptom is a low voltage on-board network. When everything is working normally, the voltmeter should show at least 13.8-14.5 volts. If, while driving, the voltage drops to 12 volts, this means that the on-board network is powered only by the battery. The generator is faulty.
5. Poor contact or damage in the battery charging circuit	e. Since there are three phases in a car generator, the rectifier bridge also consists of three branches – two diodes each. When a breakdown of one of the diodes occurs, a sharp increase in voltage in the vehicle's on-board network can be observed. A breakdown is when a diode begins to pass current in both directions, but it should only in one.
6. Breakdown of rectifier bridge diodes	f. In most cars, ground is connected to the engine somewhere at the bottom. Dirt, moisture, temperature differences, leaking oil and other factors lead to oxidation and corrosion of the joint. It manifests itself in the form of several symptoms. Firstly, due to a bad 'mass', there may be voltage drops on the vehicle's on-board network. As a result, there is a systematic undercharging of the battery. Secondly, there are significant voltage drops when a serious load is turned on – a stove, an air conditioner, a subwoofer, headlights, and so on.

Exercise 8. Read the dialogue between a mechanic and a client. Act it out. Make your own conversation based on the ideas from Exercise 7.

Mechanic: Good morning! What's the problem this time?

Client: Morning! Well, I can hear a strange squeak every time the engine starts and immediately after turning on the load.

M.: Most probably, there is a problem with the drive belt of the generator. Can you describe this strange squeak in more detail? What's it like?

C.: Yes, sure. It is like a whistle.

M.: It looks like the drive belt slippage.

C.: Slippage?... What can it be caused by?

M.: There are several reasons. Firstly, its insufficient tension. Secondly, getting water from puddles or engine oil on the generator pulley. Thirdly, the belt stretches over time, sags, and also begins to slip periodically.

C.: Oh, I see. By the way, I can hear this whistle in rainy weather.

M.: It means that water enters the generator pulley.

C.: Okay. And are you going to replace the drive belt?

M.: Well, there are two options. It can be either tightened or replaced with a new one. The first one is cheaper.

C.: Well, let's tighten it, then.

Exercise 9. Give a summary of one of the texts.

Exercise 10. Look through Unit 11 again. Make a list of the words and word combinations you consider to be the terms. Translate them into Russian.

Book 3

Unit 1. VEHICLE TECHNICAL MAINTENANCE: CHECKING ENGINE OIL AND COOLANT

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

1. technical maintenance техническая эксплуатация
2. remedy принимать меры; устранять неисправность
3. in a timely manner своевременно
4. safe and reliable operation безопасная и безотказная работа/эксплуатация
5. monitoring мониторинг; контроль; автоматическая диагностика
6. inspection проверка; осмотр
7. hood капот
8. underbody низ кузова (автомобиля)
9. exterior внешний вид
10. inside внутренняя часть; внутри
11. check проверка; контроль; проверять
12. engine двигатель; мотор
13. liquid жидкость
14. oil масло; жидкая смазка
15. belt ремень
16. hose шланг
17. suspension подвеска
18. steering system система рулевого управления
19. lighting средства освещения
20. perform выполнять; совершать; производить; проводить
21. vehicle inspection техосмотр
22. engine oil моторное масло
23. mechanical component механический компонент, механическая деталь (составная часть) в устройстве или системе

24. lubricated смазанный (особенно каким-л. раствором или веществом для большего скольжения)
25. low oil level низкий уровень масла; недостаточное количество масла
26. extensive damage невосстановимый урон; серьезное повреждение
27. bearing опорный подшипник
28. crankshaft коленвал, коленчатый вал
29. oil pump масляный насос
30. lubricating oil смазочное масло, смазка
31. friction трение
32. heating нагрев
33. touch соприкасаться
34. foam пениться, образовывать пену; вспениваться
35. insufficient в недостаточном количестве; плохой; несоответствующий
36. engine oil level уровень масла в двигателе
37. quality качество; сорт; свойство
38. density плотность; густота; вязкость
39. mixing of liquids перемешивание жидкостей
40. odor change изменение запаха
41. irregularity отклонение от нормы
42. examination осмотр; обследование; проверка
43. remedy принимать меры; устранять неисправность
44. preparation подготовка
45. level surface ровная поверхность
46. tilted наклоненный, наклонённый
47. dipstick (масляный) щуп; маслоизмерительный стержень
48. dipstick lever крышка масляного щупа
49. brightly colored окрашенный в яркий цвет
50. pull out вытаскивать, вытягивать, извлекать
51. wipe вытирать, протирать
52. measuring mark метка; отметка
53. measuring tube измерительная трубка; прикрепленная к блоку цилиндров
- трубка
54. measurement измерение; замер
55. markings разметка
56. maximum value максимальное значение; максимальный объём (масла)
57. coolant охлаждающая жидкость; охладитель; хладагент
58. freezing замерзание, застывание; замораживание
59. overheat перегрев
60. freezing point точка замерзания, температура замерзания
61. excess heat избыточное тепло
62. radiator радиатор
63. serious damage серьёзное повреждение
64. distilled water дистиллированная вода
65. engine block блок цилиндров (двигателя)
66. cooling system система охлаждения
67. antifreeze антифриз
68. refrigerant хладагент
69. composition смесь; состав; структура
70. refill доливка; доливать

71. dilute разбавлять; разжижать; разводить
72. hydrometer ареометр (прибор для определения плотности жидкостей)
73. refractometer рефрактометр; измеритель преломления
74. level уровень
75. quality качество
76. cold холодный
77. burn обжигать
78. tank расширительный бачок
79. mark риска
80. reading area on the tank место на корпусе бачка, где находятся риски, указывающие минимальный и максимальный уровни
81. prepared mixture подготовленную смесь
82. tester тестер; контрольно-измерительный прибор
83. upright position вертикальное положение
84. coolant tank бак для охлаждающей жидкости
85. squeeze сжимать; сдавливать
86. rubber резиновый
87. pump груша
88. meter измерительный прибор
89. liquid жидкость
90. read the freezing point посмотреть температуру замерзания (на шкале ареометра)
91. put a drop or two капнуть
92. gauge plate стекло призмы
93. lower the lid опустить прижимное матовое стекло; закрыть крышку
94. sample проба рабочей жидкости
95. turn toward направить на
96. light source источник света
97. eyeglass окуляр
98. coolant protection level температуру начала замерзания (кристаллизации) антифриза

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

Technical, defect, potentially, serious, manner, regular monitoring, individual systems, components, control, inspection, exterior, section, mechanical, function, result, problems, mix, periodically, examination, typically, minimum, maximum, distance, litre, tests, normal, radiator, distilled, temperature, antifreeze, mixture, refractometer, testing, position, hydrometer, tester, vertical.

Exercise 3. Read and translate Text 1.

Text 1. Engine Oil and Coolant Checks

Sources: <https://autoedu.info/en/auto-mechanic/technical-maintenance/>

Technical maintenance of the vehicle ensures that any defects that could potentially cause serious and costly vehicle crashes are remedied in a timely manner. In order to have a safe and reliable operation of the vehicle, regular monitoring of individual systems and components is required. Control checks include inspection under the hood, under the vehicle (underbody), exterior, and certain checks inside the vehicle. Checks of the engine, all liquids, and oil, belts, hoses, suspension, steering systems, lighting, and others are performed. Such vehicle inspections should be done regularly.

Engine oil check

Engine oil is required for the vehicle's mechanical components to be lubricated and to function properly during operation.

Low oil levels can cause extensive damage to the engine bearings and crankshaft. When the level is too low, the oil pump cannot deliver the required amount of lubricating oil, there is an increase in friction, heating, and damage to the bearings.

When the oil level is too high the crankshaft touches the oil during operation, creating a foam so that the bearings receive air instead of oil, resulting in insufficient lubrication and damage to the engine components. Such problems can be prevented by regular checks of the engine oil level.

Besides the oil level, quality such as color, density, mixing of liquids, and odor change is controlled. The engine oil level and quality should be checked periodically. If any irregularity is observed during the examination, a more thorough examination should be carried out immediately to identify and remedy the cause.

To check the engine oil level and quality, follow these steps:

1. Vehicle preparation: Before checking the oil level, place the vehicle on a level surface so that it is not tilted. Always check engine oil with the engine off.

2. Preparation of dipstick: The dipstick lever is usually brightly colored or it says 'OIL'. Pull out and wipe the dipstick, identify measuring marks and replace it back into the measuring tube.

3. Oil level measurement: Remove the dipstick again and read the oil level. The markings on the dipstick typically have lines indicating the minimum and maximum value of the oil level. Most often, the distance between these two values is 1 liter of oil.

4. Oil quality control: After reading the level, evaluate the color, density and odor of the oil. If any irregularity is observed, additional tests should be performed to find out a cause that changes the normal oil level or quality.

Engine coolant check

A low coolant level or freezing of the coolant can cause the engine to overheat, therefore, the coolant level, condition, and freezing point are periodically checked. The engine cooling system depends on the coolant that transfers excess heat from the engine to the radiator. Engine overheating can cause serious damage.

Distilled water with a freezing point of 0 °C is used for the coolant. In winter, when the temperature is below 0 °C, the water freezes and expands. In this condition, it may cause the engine block, head, radiator, and other parts of the engine and cooling system to break. Antifreeze is used to protect the refrigerant from freezing. Depending on the composition of the mixture of antifreeze and water, the coolant has its freezing point. Frequent refilling of water into the cooling system dilutes the mixture and raises the freezing point of the coolant. Therefore, besides the level, the freezing point of the coolant is also measured. Measurement can be done with a hydrometer and a refractometer. If the freezing point is estimated to be insufficient then it should be amplified by adding antifreeze to the refrigeration system.

To check the coolant level and quality, follow these steps:

1. Preparation for testing: The check is done when the engine is cold, because when the lid is removed, hot coolant can burn us. Locate tank position. Check the marks and wipe the reading area on the tank.

2. Level check: Read the coolant level in the tank. If the level is low, add coolant. We can add distilled water, prepared mixture of antifreeze and water or just antifreeze.

3. Testing antifreeze with a hydrometer: Place the tester in an upright position and place the hose in the coolant tank. Gently squeeze the rubber pump all the way in and then

let the meter to be filled with the liquid. Keep the hydrometer vertical and read the freezing point of the coolant.

4. Testing antifreeze with a refractometer: Put a drop or two of coolant on the gauge plate. Lower the lid to the sample, look in the eyeglass turning the refractometer toward the light source, and read the coolant protection level.

Exercise 4. Answer the questions.

1. What does technical maintenance of the vehicle ensure?
2. What systems and components must be controlled regularly?
3. Why does a car require engine oil?
4. What troubles can low oil levels cause?
5. What can too high oil level result in?
6. Why should the oil level be checked?
7. What characteristics does the oil quality include?
8. What are the steps of checking the engine oil level and quality?
9. How is the vehicle prepared for checking the oil level?
10. How is a dipstick prepared for use?
11. How is the oil level measured with the dipstick?
12. What should be performed in case there are any irregularity in oil color, density or odor?
13. What damage can be caused by a low coolant level or freezing of the coolant?
14. What can be used as a coolant?
15. Why is the freezing point of the coolant measured?
16. What devices are used for the freezing point measurement?
17. What steps should be followed to check the coolant level and quality?
18. What activities should be performed to prepare for testing?
19. How is the coolant level check done?
20. What is it necessary to do if the coolant level is low?
21. How is the antifreeze tested with a hydrometer?
22. How is the antifreeze testing done with a refractometer?

Exercise 5. Match the terms (1-7) with their definitions (a-g).

1. maintenance	a. the underside of a road vehicle
2. underbody	b. a liquid, typically one based on ethylene glycol, which can be added to water to lower the freezing point, chiefly used in the radiator of a motor vehicle
3. dipstick	c. an instrument for measuring the density of liquids
4. coolant	d. the process of keeping something in good condition
5. antifreeze	e. an instrument for measuring a refractive index
6. hydrometer	f. a metal rod with marks along one end which is used to measure the amount of liquid in a container, especially the amount of oil in a car engine
7. refractometer	g. a liquid that is used to remove heat from something

Exercise 6. Mark the following sentences as True or False.

1. Always check engine oil with the engine on. 2. The markings on the dipstick show the minimum and maximum of the oil level. 3. The coolant level check is done when the engine is hot. 4. If the coolant level in the tank is in a low position, add coolant. 5. To read the freezing point of the coolant you need to keep the hydrometer horizontal. 6. It is enough to use one or two drops of antifreeze to check it with a refractometer.

Exercise 7. Work in pairs. Read and translate a dialogue between a car mechanic and a customer. Act it out.

Mechanic: The oil level needs to be checked regularly. It's simple. I can show you how to do it.

Customer: Oh, that would be great!

M.: First, place the car on an even surface and make sure the engine is off.

C.: Okay. What's next?

M.: Now open the hood and find the dipstick. Its lever is usually brightly colored or it says 'OIL'. Pull out the dipstick and wipe it, identify measuring marks. The markings on the dipstick show the minimum and maximum of the oil level. Then, replace it back into the measuring tube.

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

M.: Next, remove the dipstick again and read the oil level. You've done it!

C.: That looks easy enough!

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

C.: Thanks a lot!

M.: You're welcome!

Exercise 8. Search the Web for other ways of testing antifreeze and make a presentation about it.

Exercise 9. 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. CHECKING BRAKE FLUID AND POWER STEERING FLUID

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

1. brake fluid тормозная жидкость
2. braking system тормозная система
3. safety and security безопасность и надёжность
4. road user участник дорожного движения, пользователь дороги
5. deceleration замедление, торможение
6. hydraulic system гидравлическая система
7. reservoir бачок (для тормозной жидкости)
8. master brake cylinder головной тормозной цилиндр
9. air inleakage просачивание воздуха; завоздушивание (системы)
10. soft brake pedal мягкая и податливая педаль тормоза
11. brake pedal тормозная педаль
12. low position of the pedal педаль в нижнем положении, проваливание педали
13. collapse разрушение, коллапс; поломка; авария; выход из строя
14. poor brake performance плохая работа тормозной системы, тормозная система работает в напряженном режиме
15. failure отказ (тормозов)
16. periodic check периодический контроль, регулярная проверка
17. replenish добавлять; пополнять, доливать
18. fluid loss утечка жидкости
19. leak течь; утечка; протекание

20. disc brake дисковый тормоз
21. brake pad тормозная накладка
22. worn-out потёртый, изношенный, старый
23. level уровень
24. visual inspection визуальный контроль; наружный осмотр
25. dark тёмный
26. turbid мутный
27. hygroscopic гигроскопический
28. absorb впитывать; абсорбировать; поглощать
29. deteriorate ухудшать, портить; изнашивать; разрушать
30. replacement замена
31. moisture влага; влажность
32. tester тестер, контрольно-измерительный прибор
33. test strip индикаторная полоска, испытательная полоска
34. multimeter универсальный измерительный прибор, мультиметр
35. quality качество
36. top up доливать, наполнять
37. marking метка, отметка (уровня); риска
38. tank бак
39. condition состояние
40. cap/cover крышка
41. inaccessible недостижимый; имеющий ограниченный доступ
42. dip макать, окунать
43. paper towel бумажное полотенце
44. evaluate оценивать, давать оценку; определять качество, важность
45. insert помещать
46. LED (Light Emitting Diode) светоизлучающий диод, светодиод, светодиод-
ный индикатор, СИД
47. humidity влажность (состава)
48. galvanic гальванический
49. adjust настраивать; регулировать; устанавливать
50. DC voltage напряжение постоянного тока, постоянное напряжение
51. plus probe плюсовой щуп
52. cylinder head крышка цилиндра; головка цилиндра
53. exceed превышать; переступать пределы, границы; выходить за пределы
54. power steering fluid рабочая жидкость усилителя рулевого механизма
55. hydraulic power steering system система рулевого управления с гидроусиле-
нием
56. hydraulic pump гидронасос, гидравлический насос
57. pressure давление
58. pipe трубопровод
59. drive gear приводной механизм; привод
60. steering wheel рулевое колесо
61. gear rack зубчатая рейка
62. air being sucked засасывание воздуха
63. malfunction неисправная работа; неправильное срабатывание
64. servo control system система с сервоуправлением; система управления сле-
дящим приводом
65. volume объём

66. overflow переполняться, выливаться
67. tank бачок (рабочей жидкости)
68. mark дополнительная маркировка (показывающие колебание объема жидкости в зависимости от её температуры)
69. technical documentation техническая документация (с требованиями автопроизводителя), инструкция по эксплуатации транспортного средства
70. fluid state состояние жидкости
71. dipstick щуп
72. appearance (quality) of the fluid состояние (качество) гидрожидкости
73. turbid мутный
74. black fluid раствор с заметным осадком
75. review просматривать
76. procedure for checking the fluid level процедура проверки уровня жидкости
77. vehicle транспортное средство, автомобиль
78. preparation подготовка
79. engine двигатель
80. heated нагретый; разогретый
81. prescribed procedure предписанная процедура
82. leak течь; утечка; протекание; протекать
83. thorough тщательный; полный; основательный; всесторонний; доскональный
84. eliminate устранять

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

Device, term, security, user, stop, hydraulic system, reservoir, cylinder, result, pedal, position, collapse, periodic, disc, visual inspection, hygroscopic, absorb, atmosphere, operation, manufacturer, regular, recommend, tester, multimeter, based, galvanic reaction, voltage, plus, probe, minus, control, minimum, maximum, information, technical documentation, procedure.

Exercise 3. Read and translate Text 1.

Text 1. Brake fluid check and Power steering fluid check

Sources: <https://autoedu.info/en/auto-mechanic/technical-maintenance/>

The braking system is one of the most important devices on the vehicle in terms of the safety and security of the vehicle and all road users. The driver performs a stop or deceleration of the vehicle through the hydraulic system. The brake system depends on the brake fluid stored in the reservoir near the master brake cylinder.

Brake fluid check

When the brake fluid level is low, air can get into the hydraulic system which is called an air inleakage and results in soft brake pedal, too low position of the pedal or collapse. This results in poor brake performance or failure. Therefore, a periodic check of the brake fluid level is required. When a lower level is observed, it should be replenished and the cause of the fluid loss detected. Brake fluid loss indicates that there is a fluid leak in the system or on vehicles with disc brakes that the brake pads are worn-out.

During the level check, a visual inspection of the condition of the brake fluid is also performed. If it is dark or turbid, the brake fluid must be replaced.

The brake fluid is hygroscopic, absorbing water from the atmosphere. Water changes the features of the brake fluid and deteriorates the operation of the brake system. Because of this, manufacturers prescribe regular replacement of the brake fluid every 2 to 4 years. However, it is recommended to check the condition of the brake fluid for moisture

every time the engine oil is changed. The check can be performed using the tester, test strips or multimeter.

To check the brake fluid level and quality, follow these steps:

1. Level check and topping up: The brake fluid level should be between the two markings on the tank. If the level is low, add the appropriate liquid and anticipate a thorough review of the braking system.

2. Visual inspection of brake fluid condition: Remove the cap from the tank and visually check the brake fluid quality. If inaccessible, dip a white paper towel and evaluate the condition based on the fluid drawn on the towel.

3. Measuring moisture using a tester: Remove the cap from the tank and insert the tester into the brake fluid. LEDs indicate the degree of humidity. When the red LED lights up (humidity above 3%), brake fluid replacement is required.

4. Measuring moisture using a multimeter: By measuring the galvanic reaction, the presence of moisture can be detected. Remove the tank cover. Adjust the multimeter to measure DC voltage. Put plus probe into the brake fluid and the minus one on the cylinder head (ground). The measured voltage should not exceed 0,3 V.

Power steering fluid check

Vehicles have the most common hydraulic power steering system. The hydraulic pump pushes the fluid under pressure through pipes to the drive gear on the steering wheel or to the gear rack. Power steering fluid must be at the proper level. When the fluid level is lower, there is a danger of air being sucked into the hydraulic system and malfunctioning the servo control system. This usually happens when the engine and power steering fluid are cold so the level is below the minimum. Also, when the engine is warmed up, the power steering fluid is heated and the volume and fluid level are increased. If the fluid exceeds the maximum level, it will overflow.

The tank is usually on the hydraulic pump itself. The minimum and maximum fluid levels are indicated on the tank. Often there is a mark next to the marking whether the measurement is done when the fluid is cold or heated. If this is not indicated on the tank, the information is obtained from the vehicle's technical documentation. Some tanks have markings for both fluid states. Some systems have a dipstick to measure the level of the power steering fluid as part of the tank cover.

In addition to the level, the appearance (quality) of the fluid should also be checked. Turbid or black fluid is dirty and old and must be replaced.

To check the power steering fluid level and quality, follow these steps:

1. Review of technical documentation: Get acquainted with the procedure for checking the fluid level in the technical documentation for that vehicle.

2. Vehicle preparation: Prepare the vehicle engine (heated and / or cold) according to the prescribed procedure for checking the level.

3. Level check: Read the fluid level according to the markings on the tank or dipstick. If the level is lower it is necessary to top up power steering fluid. The lower level tells us that fluid is leaking somewhere and a thorough system check is needed to detect and eliminate the cause of the leak.

4. Fluid quality control: After checking the level, the fluid quality is checked. If turbid or black, power steering fluid replacement is required.

Exercise 4. Answer the questions.

1. Why is the braking system regarded as one of the most important devices on the vehicle?

2. Why is it necessary to check the brake fluid level periodically?

3. What does a lower level of the brake fluid indicate?
4. How is the condition of the brake fluid checked?
5. When must the brake fluid be replaced?
6. What kind of damage may be caused by the water that the brake fluid absorbs?
7. What devices are used to check the brake fluid for moisture?
8. What steps should be followed to check the brake fluid level and quality?
9. What is the principle of operation the most common hydraulic power steering system in vehicles?
10. Why must the power steering fluid be at the proper level?
11. What is the tank for the power steering fluid like?
12. What steps should be followed to check the power steering fluid level and quality?

Exercise 5. Match the terms (1-7) with their definitions (a-g).

1. brake	a. the amount of water in the liquid, air, etc.
2. brake fluid	b. a device that tests the functioning of something
3. hygroscopic	c. a point on a scale, for example a scale of amount
4. tester	d. a device for slowing or stopping a moving vehicle, typically by applying pressure to the wheels
5. steering	e. the mechanism in a vehicle which makes it possible to steer it in different directions
6. level	f. (of a substance) tending to absorb moisture from the air
7. humidity	g. fluid used in a hydraulic brake system

Exercise 6. Mark the following sentences as True or False.

1. The brake fluid must be replaced once in 10 years. 2. The brake fluid absorbs water from the atmosphere. 3. The brake fluid level should be between the minimum and maximum markings on the tank. 4. Some tanks for the power steering fluid have HOT and COLD markings for both fluid states. 5. To check the power steering fluid level the vehicle engine must be always cold. 6. A turbid or black power steering fluid means it must be changed.

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, I have.

M. 1: What was the trouble with it?

M. 2: The car owner had complained about a soft brake pedal. Well, I replaced the brake fluid.

M. 1: Let's review what you did before we give the car back to the customer.

M. 2: Okay. First, I checked the brake fluid level. It was a bit low. I thought about possible leakage... so, then, I checked the whole braking system. It's all right.

M. 1: And what about the quality check of the brake fluid? Did you inspect its condition?

M. 2: Yeah, sure. The visual inspection showed that it was rather dark and turbid.

M. 1: Did you measure moisture as well?

M. 2: Yes, I did. The tester showed that humidity was four percent. So, I replaced the brake fluid. And now everything is fine.

M. 1: Good job! I'll call the customer and tell him that his car is ready.

Exercise 8. Search the Web for tips about choosing and purchasing the appropriate brake fluid and make a presentation about it.

Exercise 9. 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. CHECKING WINDSHIELD WASHER SYSTEM AND VEHICLE LIGHTING

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

1. windshield ветровое стекло; переднее стекло
2. windshield washer омыватель ветрового стекла; стеклоомыватель
3. lighting освещение
4. road user участник дорожного движения, пользователь дороги
5. windshield washer омыватель ветрового стекла
6. reviewing проверка
7. washer омыватель
8. fluid level уровень жидкости
9. washing system система омывания лобового стекла; система очистки ветрового стекла
10. washing liquid омывающая жидкость
11. tank бачок
12. washing pump промывочный насос
13. hose шланг; соединительный шланг
14. nozzle форсунка; сопло
15. wiper стеклоочиститель
16. blade щётка (стеклоочистителя)
17. hood капот
18. rear window заднее окно
19. fluid reservoir бачок для жидкости
20. rear задняя часть
21. boot багажник
22. manual инструкция; руководство
23. filler cap крышка наливного отверстия, крышка заливной горловины
24. engine oil моторное масло
25. service проводить технический осмотр, ремонтировать; техническое обслуживание
26. dusty запылённый, пыльный
27. humid влажный, сырой
28. inspection контроль; проверка; осмотр
29. freezing замерзание; замораживание
30. dishwashing detergent жидкость для мытья посуды
31. laundry стирка
32. detergent очищающее, моющее средство; детергент
33. chemical химическое вещество, химикат
34. damage повредить; разрушать; наносить ущерб
35. electric pump электрический насос
36. pressure fluid рабочая жидкость; напорная жидкость; жидкость под давлением
37. sprayer разбрызгиватель, распылитель

38. divert отводить; отклонять, направлять
39. assess определять; оценивать
40. clogged забитый; засоренный
41. jet струя
42. remove снимать; извлекать
43. blower воздуходувка; установка для продувания сжатым воздухом; ком-прессор
44. needle игла; иголка
45. redirect перенаправлять
46. positioning установка в определённом положении; регулировка положения
47. tool инструмент; средство; орудие; приспособление
48. adjustment регулирование; регулировка, подгонка, наладка, настройка
49. defective дефектный; неисправный; поврежденный; некачественный
50. worn старый, подержанный, сносившийся
51. external control внешний осмотр
52. wiper arm рычаг стеклоочистителя
53. external influence внешнее воздействие
54. flexible гибкий; упругий; эластичный
55. frayed потёртый, потрёпанный, поношенный, старый
56. bend сгибаться, гнуться; изгибаться; поворачиваться, отклоняться
57. hinge крючок; шарнир; шарнирное крепление
58. handle/lever рычаг
59. scratch поцарапать
60. fit better подходить, лучше подогнать, обеспечить правильное прилегание к стеклу
61. tension натяжение; напряжение; затягивать
62. thrust тяговое усилие; противодействующая сила; осевое давление
63. refill доливать; пополнять
64. trace след, отпечаток; *мн. ч.* разводы
65. lighting system система освещения и световой сигнализации (автомобиля)
66. poor visibility плохая видимость
67. pedestrian пешеход
68. exterior lighting наружное освещение; внешние элементы осветительной системы
69. headlight фара; передняя фара
70. dipped and main beam ближний и дальний свет фар
71. day running lights дневные ходовые огни
72. position lamp/light габаритный фонарь
73. turn signal light сигнал поворота, поворотник
74. parking lights габаритные огни
75. fog light противотуманный фонарь; противотуманная фара
76. signal light световой сигнал
77. lock запирать; замок; блокировать
78. alarm аварийный сигнал; аварийная сигнализация
79. stop light стоп-сигнал
80. license plate light фонарь освещения номерного знака; осветитель регистра-ционного знака
81. direction indicator указатель направления; поворотник
82. parking light фонарь стояночного освещения

83. reversing light фонарь заднего хода
84. (head)lamp-cluster блок-фара
85. interior lighting внутреннее освещение; внутренние элементы осветительной системы
86. cabin lighting освещение салона; лампы в салоне автомобиля
87. instrument panel lighting лампы освещения приборной панели
88. control panel lighting лампы освещения панели управления
89. glove box lighting лампы в перчаточном ящике
90. decorative light декоративная подсветка
91. shady тенистый, затенённый
92. checklist контрольный перечень (работ); контрольный список
93. roof крыша
94. body корпус; кузов
95. manual switch ручной переключатель
96. remote key дистанционный ключ
97. door дверь; дверца
98. interior cab light внутреннее освещение кабины/салона
99. luggage compartment багажный отсек, багажник
100. deficiency недостаток, дефект
101. arrangement расположение; устройство; наладка; установка; схема
102. bulb лампочка; лампа
103. operating instruction инструкция по эксплуатации

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

Risk, reservoir, information system, locate, service, correct, detergent, chemical, electric, spray, position, cleaning, pneumatic, special, telescopic, defective, control, garage, constant, examination, manufacturer, location, distilled, visual inspection, signal, type, exterior, lamp, parking, stop, license, indicator, reverse, interior, cabin, instrument, panel, decorative, automatically activated, situation, comfortable, inspect, park, assistant, instruction, test.

Exercise 3. Read and translate Text 1.

Text 1. Checking Windshield Washer System and Vehicle Lighting

Source: <https://autoedu.info/en/auto-mechanic/technical-maintenance/>

Driving with a dirty windshield poses a risk to all road users. Therefore, the washing system is an important safety system and should always be ready for operation. Checking the windshield washer system includes reviewing the washer fluid levels, condition of the washer system, and quality of the windshield washer.

The washing system consists of a washing liquid, a liquid tank, a washing pump, hoses, nozzles, and a wiper system with blades. A tank of washing liquid is usually located under the hood of a vehicle. For some vehicles that have a rear window washer, the fluid reservoir may be separate and it can be located in the rear of the vehicle or the boot. See the information system or manual to locate the tank and the filler cap.

The windshield washer fluid should be checked whenever the engine oil is changed and each time the vehicle is serviced. Driving in dusty or humid conditions may require more frequent inspections. It is important to use the correct windshield washer fluid. In winter, a liquid that protects against freezing is used.

Checking windshield washer system

Never use laundry or dishwashing detergent as the chemicals in the detergent may damage the vehicle.

The electric pump in the tank pushes the pressure washer fluid through the hose to the sprayer which sprays and diverts it to the windshield. By checking the washing system, we assess the condition of the sprayer and its position.

If the sprayer is clogged or a weak jet of liquid comes out of it, it is necessary to clean it. The sprayers are easy to remove to perform cleaning. They can be blown with a pneumatic blower or cleaned with special needles. When the sprayer cannot be cleaned, it is replaced with a new one.

In case the sprayer does not redirect the liquid correctly on the windshield, its positioning is performed. There is a special telescopic tool for this adjustment that makes it easier for us to direct the jet of washing liquid.

The wipers together with the washing fluid application system help the driver to see clearly in front of the vehicle in all driving conditions. Defective wiper blades make it difficult to wash the windshield. Inspections of vehicles often show that the wipers are missing, damaged, or worn.

Wiper blades should be checked as part of external control. The wiper blades and wiper arms should be checked. If the vehicle is not garaged, due to the constant external influence, the wiper blades will be ready for replacement after only one year. The wiper blade should be flexible and not frayed. The wiper arm should bend at the hinges, hold firmly and push the wiper blade against the windshield. The wiper blade and wiper handle are checked with one examination of the hand.

Never use wipers when they are dry as this may damage blades or scratch the windshield surface. Never bend the handles to make the blades fit better on the glass. The handles are tensioned by the manufacturer and you can only damage them. If you find that the lever has lost thrust, replace it.

To check the windshield washer system, follow these steps:

1. Refill washing liquid: Determine the location of the washer fluid reservoir cover. Check the level in the tank and add the washing liquid. You can add distilled water or special windshield washer fluid.

2. Check the pump: Wet the windshield and turn on the wipers. Then turn on the washer fluid pump and check the washer system pump and sprayer condition. Evaluate the condition of the wipers based on the traces of the wiped glass.

3. Check the sprayer: If the sprayer is clogged, remove the sprayer. First visually check the sprayer and then clean it with a pneumatic blower and, if necessary, cleaning needles. When cleaning fails, replace it with a new one. If there is a possibility of adjustment, perform positioning with a special tool.

4. Check wiper blade and wiper arm: Check the condition of the wiper blade and wiper arms by visual inspection and touch. If any irregularity is found, replace the wiper blade or arm.

Vehicle lighting check

The lighting system allows the driver to see the area in front of the vehicle at night and in conditions of poor visibility, to signal to other drivers and pedestrians, as well as better visibility inside the vehicle.

There are several types of the vehicle lighting. The exterior lighting of the vehicle is divided into front and rear. The headlights include dipped and main beams, day running lights, position lamps, turn signal lights, parking lights, fog lights, and signal lights (vehicle lock / unlock, alarm...). The rear lighting includes a position light, stop light, license plate light, direction indicators, parking light, reversing light, fog light, and signal lights (vehicle lock / unlock, alarm...). Some of these lights may form a (head)lamp-cluster on most models.

Interior lighting includes cabin lighting, instrument panel lighting, control panel lighting, glove box lighting and decorative lights. This lighting can be automatically activated and switched off when entering the vehicle, switching off the engine, opening the boot, and other situations that require a comfortable stay and use of the vehicle interior.

To inspect the vehicle lighting, park the vehicle in an enclosed or shady area to see the lights more easily. You need an assistant to check the exterior lighting of the vehicle. It is advisable to have a checklist to make sure you have examined everything.

For interior lighting, check the instrument panel and control panel lighting. Check the lights on the roof of the body. It is usually switched on and off via a manual switch.

Use the remote key to unlock and lock the vehicle. On most vehicles, the cabin lighting is automatically switched on and off. Check this feature.

When the door is opened and closed, the interior cab light is activated automatically. Check all doors on the vehicle. Also, check that the luggage compartment lighting is correct.

To check vehicle lighting, follow these steps:

1. Checking the front exterior lighting: With the help of an assistant and a checklist, check the correct front lighting of the vehicle. Enter any irregularity in the list in order to subsequently correct that deficiency.

2. Check the rear exterior lighting: At the rear of the vehicle, pay attention to the arrangement of the lights, because due to incorrectly placed or incorrect bulbs, we have incorrect lighting.

3. Checking the interior lighting: If you are unsure, use the operating instructions to find out which interior lighting this vehicle has. You do not need an assistant for this test.

Exercise 4. Answer the questions.

1. Why is a washing system regarded as an important safety system?
2. What does the washing system include?
3. Where is a tank for washing liquid located?
4. When should the windshield washer fluid be checked?
5. Why is laundry or dishwashing detergent unsuitable for a washing system in a vehicle?
6. What is the electric pump in the tank used for?
7. When is the sprayer needed to be cleaned?
8. When is positioning of the sprayer performed?
9. Why should wiper blades be checked?
10. What are the steps of the windshield washer system check?
11. Why does a vehicle need a lighting system?
12. What are the types of the vehicle lighting?
13. What does interior lighting consist of?
14. Is it a good idea to check the exterior lighting of the vehicle without any assistant?
15. What steps should be followed to check vehicle lighting?

Exercise 5. Match the terms (1-7) with their definitions (a-g).

1. windshield	a. equipment in a vehicle for producing light
2. windscreen wiper	b. the small lights on the side of a vehicle, for use when parking the vehicle at night; they help other drivers to notice the vehicle and to judge its width
3. headlight	c. a sign on the front and back of a vehicle that shows its license number
4. parking lights	d. the glass window at the front through which the driver looks
5. license plate	e. a piece of equipment used for spraying liquid somewhere

6. vehicle lighting	f. a power-operated device that wipes rain from a vehicle's windscreen, typically with a rubber blade on an arm that moves in an arc
7. sprayer	g. a powerful light at the front of a motor vehicle

Exercise 6. Mark the following sentences as True or False.

1. Drivers should use different windshield washer fluids in summer and wintertime.
 2. A tank of washing liquid is always located in the boot of a vehicle. 3. A vehicle washing system includes a washing liquid, a tank, a pump, hoses, nozzles, and wipers. 4. The condition of the wiper blades is not important. 5. The sprayers should be replaced each time the vehicle is serviced. 6. The lighting system is used to signal to other drivers and pedestrians and to provide better visibility inside the vehicle. 7. To check the correct interior lighting of the vehicle a mechanic needs an assistant.

Exercise 7. Work in pairs. Read and translate a dialogue between two mechanics.

Act it out.

Mechanic 1: I need to check the lighting of this car. Can you help me?

Mechanic 2: Yes, sure. Do you have the checklist ready?

M. 1: Yes, go ahead.

M. 2: Okay, let's start with the front exterior lighting. Well, the headlights, dipper and main beams, position lamps and signal lights are fine. But one of the turn signal lights isn't functioning.

M. 1: Which one? The left one?

M. 2: No, the right one.

M. 1: Can you see any damage on it?

M. 2: No, it looks fine. I think the bulb isn't working.

M. 1: Okay. The right turn signal light. Got it. And how are the fog lights?

M. 2: They're all right.

M. 1: Great. Now, let's check the rear lighting. What about the stop lights?

M. 2: They're fine. The position lights, direction indicators, parking lights, reversing lights, fog lights, and signal lights look all right, too. But the license plate light isn't functioning.

M. 1: Okay, no license plate light. Got it. I'll deal with the interior lighting by myself. Thanks a lot for your help.

M. 2: You're welcome!

Exercise 8. Search the Web for tips about choosing and purchasing the appropriate windscreen wipers or about different types of car lights and make a presentation.

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. UNDER-VEHICLE INSPECTION

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

1. under-vehicle inspection осмотр днища автомобиля
2. oil change замена масла
3. emergency service аварийное техническое обслуживание
4. emergency repair неотложный ремонт
5. for safety reasons по соображениям безопасности

6. systematic visual inspection систематический наружный осмотр
7. control system система управления
8. suspension подвеска
9. exhaust выпускной трубопровод; выхлоп; отработавшие газы
10. brake system тормозная система
11. leak течь; утечка; протекание
12. engine двигатель; мотор
13. transmission коробка передач; передача; привод; трансмиссия
14. tank бак
15. brake тормозной механизм; тормоз
16. overview беглый осмотр
17. chassis ходовая часть; шасси
18. exposed незащищённый, открытый; подвергающийся воздействию (окружающей среды)
19. hoist лебёдка; подъёмный механизм, подъёмник
20. front передняя часть
21. wheel колесо
22. steering system система рулевого управления
23. front suspension подвеска передних колёс; передняя подвеска
24. exhaust system система выпуска отработавших газов
25. fuel line топливопровод
26. brake line тормозная магистраль
27. parking brake cable трос привода стояночного тормоза
28. rear part задняя часть
29. rear wheel заднее колесо
30. rear-wheel drive передача на задние ведущие колёса; задний привод
31. rust коррозия; ржавчина
32. axial осевой
33. bearing подшипник
34. tie-rod круглая соединительная тяга
35. tie-rod end наконечник тяги
36. idler промежуточная шестерня, паразитная шестерня; натяжной шкив
37. pitman arm рулевая сошка
38. steering rack рулевая рейка
39. front-wheel drive передача на передние ведущие колёса; передний привод
40. axle мост; ось
41. constant velocity joint шарнир для передачи постоянной частоты вращения
42. dust boot пыльник
43. cracked треснувший; расколотый
44. shock absorber амортизатор
45. spring пружина; рессора
46. coolant охлаждающая жидкость; охладитель; хладагент
47. oil масло; жидкая смазка
48. fuel топливо; горючее
49. engine mount узел двигателя; *мн.ч.* монтажные опоры двигателя
50. coolant hose шланг для охлаждающей жидкости
51. belt лента; ремень
52. gearbox housing картер коробки передач
53. clutch housing картер сцепления

54. external connection внешнее соединение
55. connector соединитель; соединительное устройство; соединительная муфта
56. fluid жидкость
57. loose имеющий люфт; незатянутый; разболтанный
58. bolt болт; палец; шпилька
59. gear lever рычаг переключения передач
60. tighten затягивать; подтягивать
61. clamp зажим; фиксатор; хомут; *мн.ч.* крепёжные детали
62. bracket кронштейн; держатель
63. corrosion коррозия
64. deterioration изнашивание; износ; повреждение
65. hanger подвесной кронштейн; крюк
66. heat shield теплозащитный экран; теплозащита
67. pipe труба; трубка
68. hose шланг
69. bend изгиб; перегиб
70. pinch сжатие; передавливание
71. holder крепление, узел, фиксатор, зажим
72. support держатель; опора; опорная стойка
73. rear axle задний мост; задняя ось
74. driveshaft приводной вал; ведущий вал; карданный вал
75. universal joint карданный шарнир с крестовиной; шарнир Гука
76. dent вмятина; выбоина
77. distortion деформация; искажение; коробление
78. shaft вал
79. differential дифференциал
80. oil seal масляное уплотнение; сальник
81. rubber резина; резиновый
82. protective cover предохранительный кожух; защитный чехол
83. fuel tank топливный бак; бензобак
84. filling pipe наливная труба; наливной рукав
85. fuel delivery подача топлива
86. component компонент; деталь; узел; составной элемент
87. rocking раскачивание
88. turning вращение
89. manually ручным способом, вручную
90. rubber sleeve резиновый шланг
91. wheel drive привод колеса
92. gasket прокладка; уплотнение
93. wheelbase колёсная база
94. fuel distribution распределение топлива

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

Service, recommended, detailed inspection, systematic visual inspection, position, transmission, chassis, mechanical, chemical, procedure of inspection, elements of systems, parking, cable, finally, inspect, constant, shock, absorber, bolt, mechanism, bracket, corrosion, universal, differential, metal, plastic, ventilation, component, manual, vertical, distribution.

Exercise 3. Read and translate Text 1.

Text 1. Under-vehicle Inspection

Source: <https://autoedu.info/en/auto-mechanic/technical-maintenance/>

With every oil change, emergency service or repair recommended a detailed inspection of under the vehicle. There are many systems under the vehicle that must be correct for safety reasons. The under-vehicle inspection is a systematic visual inspection of the control system, suspension, exhaust, and braking. From this position, leaks can be detected on the engine, transmission, tank, and brakes. Also, an overview of the condition of the chassis because it is most exposed under the vehicle due to various mechanical and chemical influences during the operation of the vehicle.

When the vehicle is safely lifted on a hoist, a under vehicle inspection is a good way to see the general condition of the vehicle. Additional areas of concern will often be found during the inspection.

The inspection under the vehicle is performed in detail, following the procedure of inspection and checking the condition of the elements of different systems.

The front of the vehicle is first inspected, which includes the wheels, steering system, front suspension, engine and transmission leaks.

The condition of the exhaust system, fuel lines, brake lines and parking brake cable is then checked.

Finally, the rear part is inspected, which includes the rear wheels, suspension, tank condition and, if the vehicle is rear-wheel drive, its power transmission elements from the engine to the rear wheels.

During the entire inspection, the condition of the chassis for damage and rust is visually determined.

Wheels: Check that there is no axial movement of the wheels and the condition of the bearings.

The steering: Inspection of the steering system part under the vehicle includes the tie-rods and tie-rod ends, idler and pitman arm and steering rack.

Front-wheel drive axle: This inspection includes the constant velocity joints (CV joints) and dust boots. Look for cracked, torn, or leaking boots.

Suspension: Check front and rear shock absorbers, suspension elements and springs.

Engine: Check for coolant, oil and fuel leaks. Inspect for cracked or damaged engine mounts, coolant hoses, and belts.

Transmission: This review includes the gearbox housing, clutch housing, external connections and connectors. In the transmission area, check for fluid leaks, loose bolts, damaged or loose clutch mechanisms or gear levers.

Exhaust system: It may be necessary to tighten the clamps and bolts on the exhaust system or on the exhaust line with bolts or brackets. Check for signs of exhaust leakage, corrosion or deterioration, including hangers. Check the condition of each heat shield.

Pipes and hoses: Inspect the condition of the brake hoses and fuel lines for bends, pinches, rust, and leaks. Determine if the condition of the holders and supports of the pipes and hoses are in place.

Parking brake cables: Check for rusted, frozen, broken, or crushed cables.

Rear-wheel drive: The drive axle transfers the drive from the transmission to the rear axle of the vehicle (rear-wheel drive). Check for any loose movement in driveshaft universal joints. Look for any dents or distortions in the shaft. The rear axle includes a differential and rear axles. Look for leaks around the differential and the condition of the oil seal and protective rubber covers.

Fuel tank: The fuel tank can be made of metal or plastic, depending on the vehicle. The inspection should include the filling pipe and hose, ventilation and fuel delivery hos-

es, tank belts and protective shields. The fuel tank must be safe and inspect the fuel lines for damage or corrosion.

To perform an under-vehicle components inspection, follow these steps:

1. Front of the under vehicle: Check the wheel for axial movement by manual vertical rocking and bearing condition by turning. Check the condition of all suspension elements by manually moving and inspecting the rubber sleeves. Perform an inspection of the steering elements and wheel drives. Check the condition of the engine and transmission for leaks and the condition of the belts, oil seals and gaskets.

2. Wheelbase under vehicle area: Check the condition of the exhaust line and its elements for corrosion and damage. Inspect exhaust lines and hangers. Inspect brake lines, parking brake cable, and fuel distribution hoses.

3. Back of the under vehicle: Check the condition of the rear wheels and suspension system. If the vehicle has a rear-wheel drive, inspect all elements of that drive. Inspect the condition of the fuel tank and its elements.

Exercise 4. Answer the questions.

1. What systems must be checked during the under-vehicle inspection?
2. What systems are inspected first?
3. What should be checked next?
4. What systems are finally examined?
5. What does inspection of the wheels include?
6. What does inspection of the steering consist of?
7. What does inspection of the front wheel drive axle comprise?
8. What parts of the suspension must be inspected?
9. What must be checked in the engine?
10. What transmission components must be examined?
11. What is inspection of the exhaust system made up of?
12. How are pipes and hoses inspected?
13. What is checked during the parking brake cables inspection?
14. What is it necessary to check in the rear wheel drive?
15. What should the inspection of the fuel tank include?
16. What three steps should be followed to perform the under-vehicle components inspection?

Exercise 5. Match the terms (1-8) with their definitions (a-h).

1. rear-wheel drive	a. the system of gears and shafts on a car or other vehicle by which the power from the engine reaches and turns the wheels
2. vehicle's suspension	b. the circular objects of a vehicle which are fixed underneath it and which enable it to move along the ground
3. brakes	c. the distance between front and back wheels of a car or other vehicle
4. transmission	d. the part of a car or other vehicle that produces the power which makes the vehicle move
5. wheels	e. a device fitted near the wheels of a car or other vehicle to reduce the effects of travelling over uneven ground
6. shock absorber	f. the springs and other devices attached to the wheels, which give a smooth ride over uneven ground
7. engine	g. devices in a vehicle that make it go slower or stop
8. wheelbase	h. the system that provides power to the rear wheels of a motor vehicle

Exercise 6. Mark the following sentences as True or False.

1. The under-vehicle inspection includes the windshield check and light functionality check. 2. The procedure of the under-vehicle inspection has three stages: firstly, the front of the vehicle is inspected; secondly, the exhaust system, fuel lines, brake lines and parking brake cable are checked; and, thirdly, the rear part is examined. 3. The condition of the steering elements, the engine and transmission are checked during the under-vehicle inspection of the rear part of the vehicle. 4. The rear wheels and the fuel tank are inspected as a part of the front under-vehicle inspection. 5. Parking brake cables must be checked for rusted, frozen, broken, or crushed ones. 6. The engine must be inspected for coolant, oil and fuel leaks.

Exercise 7. Work in pairs. Read and translate a dialogue between a mechanic and a client. Act it out.

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 8. Search the Web for ideas how to do a quick safety inspection of your vehicle yourself and make any necessary repairs. Make a presentation.

Exercise 9. 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. ENGINE AIR FILTER REPLACEMENT AND
CHANGING ENGINE OIL AND FILTER**

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

1. air filter воздухоочиститель; воздушный фильтр
2. replacement замена
3. changing смена, замена
4. engine oil моторное масло
5. oil filter масляный фильтр

6. impurity загрязнение; примесь; чужеродные частицы; микроскопические твердые частицы; скопившаяся грязь и пыль
7. intake air всасываемый воздух
8. dust пыль
9. sand песок; песчинка
10. abrasive обладающий абразивными свойствами
11. engine life срок службы двигателя, технический ресурс двигателя
12. permeability проходимость
13. fuel consumption расход топлива, потребление горючего
14. engine operation работа двигателя
15. replacement interval интервал между заменами
16. blockage засорение, закупоривание
17. light source источник света
18. annular круглый; круглый (фильтр) в виде кольца
19. square прямоугольный; прямоугольной формы
20. appropriate box отдельный моторный отсек
21. intake line воздухозаборная магистраль
22. remove снимать; извлекать
23. filter housing cover крышка корпуса фильтра
24. fall into осыпаться
25. suction line впускной коллектор
26. install устанавливать; уложить на место
27. duct воздуховод; воздухозаборник
28. crack трещина
29. hole дыра; отверстие
30. unobstructed suction беспрепятственное прохождение
31. inside of the case дно и стенки корпуса
32. compare сравнивать
33. installation установка
34. fit correctly выполнить установку (сменного фильтра) аккуратно; уложить (новый фильтр) аккуратно на место
35. base of the housing дно корпуса
36. air воздушный поток
37. bypass проходить в обход фильтра (через образовавшиеся щели)
38. place the cover установить крышку
39. fasten закреплять; закрутить (винты, фиксирующие крышку)
40. connect подсоединять; соединять
41. tighten зажимать; затягивать; закручивать
42. suction hose всасывающий шланг; шланг воздухозаборника
43. clamp зажим; фиксатор; хомут; защелка; пружинный держатель
44. loosen раскручивать; открутить (фиксирующие винты)
45. unscrew отвинчивать
46. nut гайка (крепления крышки фильтра)
47. release расцеплять; откреплять; открутить
48. fastener крепёжная деталь, деталь крепления
49. hose шланг
50. housing корпус
51. reuse снова использовать; повторно использоваться
52. blow дуть; продувать (сжатым воздухом)
53. hit ударять; стучать; бить обо что-либо

54. dirt грязь; загрязнение
55. matrix мембрана фильтра; фильтрующий материал
56. channel канал; паз
57. aligned correctly выровненный должным образом
58. reinstall устанавливать повторно, вернуть на место
59. hose clamp зажим шланга; хомут шланга
60. service maintenance эксплуатационная поддержка; техническое обслуживание
61. maintenance interval интервал между техническими обслуживаниями; периодичность технического обслуживания
62. oil pan масляный поддон; поддон картера
63. service interval сервисный интервал
63. vehicle manufacturer автопроизводитель; производитель автомобиля
64. mileage пробег автомобиля (в милях)
65. time interval временной интервал, промежуток времени
66. operating conditions условия эксплуатации, рабочие условия
67. oil life срок службы масла до замены
68. amount объем
69. prescribe указывать; устанавливать
70. additive примесь; присадка; добавка
71. wear of engine parts трение (металлических) деталей двигателя
72. small pieces of metal/small metal flakes/metal chips стружка
73. remove particles фильтровать (абразивные) частицы и отходы от сгорания топлива
74. carbon from combustion продукты горения
75. heavy particle тяжёлая частица
76. clog забиваться; засоряться
77. restrict ограничивать; ухудшать
78. flow поток; подача
79. smooth ровный; однородный; равномерный
80. lubrication смазка; смазывание
81. for longer and proper engine operation для продления срока службы и обеспечения ровной работы двигателя
82. replacement interval интервал между заменами
83. draining слив
84. warmed up прогретый (до рабочей температуры двигатель)
85. burn обжигать
86. drain plug пробка сливного отверстия
87. lower нижняя часть; нижняя точка
88. raise to the appropriate height поднять на необходимую высоту
89. drain pan поддон для сбора масла/ёмкость для отработки (старого масла, которое сливают)
90. trajectory траектория
91. magnetic drain plug сливная пробка с магнитом
92. settle оседать, выпадать в осадок
93. seal/gasket прокладка, уплотнение
94. disposable выбрасываемый (после употребления); разовый, одноразовый
95. accommodate подгонять; соединять герметично
96. irregularities неровности
97. oil leakage утечка масла; подтекание масла
98. excessive tightening слишком сильное затягивание

99. damage the thread повредить резьбу
 100. appropriate tightening force соответствующая сила закручивания; нужное усилие при прикручивании
 101. loosely tightened слабо закрученная
 102. destruction повреждение; поломка
 103. overtighten чрезмерно затягивать; сильно закручивать
 104. oil cap колпачок маслёрки
 105. check the oil level замерять уровень масла
 106. start the engine запускать двигатель
 107. pressure давление
 108. add добавлять
 109. operating temperature рабочая температура
 110. circulate циркулировать, двигаться; передвигаться
 111. lubrication system система смазки, смазочная система
 112. spin-on oil filter навинчиваемый масляный фильтр; неразборный фильтр (состоит из тонкостенного металлического корпуса с присоединительной резьбой, фильтрующего элемента (шторы) и нескольких клапанов)
 113. cartridge oil filter модульный масляный фильтр, состоящий из съёмного корпуса (модуля) и сменного фильтрующего элемента (картриджа)
 114. one-piece неразъёмный, цельный
 115. threaded base с резьбой для выкручивания и закручивания
 116. special filter wrench специальный ключ или специальный съёмник для снятия масляного фильтра
 117. mount by hand демонтировать вручную; повернуть руками
 118. supplied with поставляется в комплекте с
 119. rubber sealing ring резиновая уплотнительная прокладка; резиновое уплотнительное кольцо
 120. stick прилипать; приклеиваться
 121. engine block блок двигателя; блок цилиндров (двигателя)
 122. mount over установить поверх
 123. leak течь; просачиваться; протекать; подтекать
 124. surface поверхность
 125. apply oil смазывать (новым) маслом; обработать маслом (прокладку до установки в посадочное место)
 126. ungreased несмазанный; сухой
 127. groove паз

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

Filter, periodic, abrasive, period, based, normal, original, blockage, km, inspect, filtered, channel, service interval, type, metal, periodically, recommendations, draining, temperature, trajectory, magnetic, plastic, aluminum, deformed, silicone, stop, recommended, start, monitor, maximum, circulate, system, cartridge, special, block.

Exercise 3. Read and translate Text 1.

Text 1. Engine Air Filter Replacement and Changing Engine Oil and Oil Filter

Source: <https://autoedu.info/en/auto-mechanic/technical-maintenance/>

Engine air filter replacement

During engine operation, the filter separates all impurities from the intake air and it is necessary to perform periodic replacement of the filter. Dust and sand in the air can be very abrasive and shorten engine life if not filtered. As the filter retains impurities, it reduces the

permeability of air over time. When enough air no longer passes through the filter, the engine cannot produce enough power and fuel consumption increases. All vehicles have a prescribed air filter replacement period based on normal engine operation. However, when the vehicle is used in an unfavorable environment such as dust, the life of the filter is shorter.

A filter of the same size and shape as the original is used for replacement. Periodically between two replacement intervals, it is advisable to check the air filter for excessive dirt or blockage. The best way to check is to remove the filter and place it towards the light source. If little or no light passes through the filter, it should be replaced. Air filters are usually changed every 50,000 km or every other engine oil change.

The air filters can be annular or square and are located inside the appropriate box at the very beginning of the engine intake line. After removing the filter housing cover, carefully remove the old filter so that impurities do not fall into the suction line. Before installing a new filter, inspect the suction line housing and duct for cracks or holes that would allow unobstructed suction of unfiltered air. If necessary, clean the inside of the case.

Compare the new filter with the old one to make sure they are the same. During installation, make sure that it fits correctly on the base of the housing. If the filter is not installed correctly, air can bypass the filter and enter the engine without filtering. Place the cover over the filter and fasten it. If you have previously removed, connect and tighten the suction hoses with clamps.

To replace the air filter, follow these steps:

1. Remove the filter: Loosen and remove the filter housing cover by unscrewing the nut or releasing the fasteners. It may be necessary to loosen the clamps and remove the suction line hoses to remove the housing cover. Carefully remove the air filter from the housing.

2. Check the filter: Hold the filter up to the light and look through it. If the filter is undamaged or cracked, it can be reused. If it does not transmit light or is damaged in any way, replace the filter. Do not blow it out with the air or hit the ground to remove dirt. This will damage the filter matrix so that dirt will pass through it if used again.

3. Filter installation: Clean the inside of the filter housing. Also, inspect the housing and all channels for cracks or holes. Compare the new air filter with the old one, check if they are exactly the same. Install a new filter inside the housing and check that it fits correctly and is aligned correctly on both sides. Put the cover on and fasten to the housing. Reinstall and tighten the suction hose clamps.

Changing the engine oil and filter

The engine oil is changed and the oil filter is replaced according to the service maintenance interval or when the oil pan is removed due to engine service work. The service interval is prescribed by the vehicle manufacturer and may be based on mileage interval, time interval, operating conditions, or oil life. The type and amount of engine oil are also prescribed by the manufacturer.

The engine oil gets dirty over time and the additives wear out. Also, due to the wear of engine parts, small pieces of metal get into the oil. The filter removes particles found in the oil, such as carbon from combustion or small metal flakes. The heavier particles fall to the bottom of the oil pan. The oil filter is changed periodically to ensure that it does not clog, which would restrict the flow of oil and the smooth lubrication of engine parts.

For longer and proper engine operation, dirty and worn oil is periodically removed, as well as a dirty oil filter. The replacement interval and the type of engine oil are prescribed by the vehicle manufacturer and it is necessary to adhere to the given recommendations.

Changing the engine oil

Draining the oil from the engine is done when the engine is fully warmed up. This allows the dirt to mix more easily with the oil and get it out of the engine together. You

need to be careful when draining because the oil temperature is between 90-140° C and can burn you.

The drain plug is located on the lower or side of the oil pan. The vehicle is raised to the appropriate height. A drain pan is placed under the engine near the drain plug, assessing the oil trajectory when the plug is removed. In some vehicles, the drain plug is magnetic to attract metal chips that settle to the bottom of the oil pan. By removing the plug, the chips are removed and it is necessary to clean it before installation.

There is a seal on the oil drain plug, which should be inspected and possibly replaced after removing the plug. Gaskets made of plastic, aluminum or fiber are disposable. They are changed because they are deformed to accommodate oil pan and plug irregularities. Such a seal will not adjust well when reused and oil leakage will occur. Excessive tightening can damage the oil pan thread, especially if it is made of aluminum. Only silicone seals can be reused if they are not damaged.

The drain plug should be tightened with the appropriate tightening force. If it is loosely tightened while driving, the plug may fall off, leaking oil which can lead to engine destruction if not stopped immediately. On the other hand, if the plug is overtightened, the threads on the oil pan can be damaged, which requires replacement of the oil pan, especially if it is made of aluminum.

When the drain plug and new oil filter are installed, the vehicle is lowered, the oil cap is removed and the appropriate oil is added as recommended by the vehicle manufacturer. After pouring the recommended amount, the oil level is checked, the engine is started and the condition around the plug and filter is monitored for leaks, oil level and pressure. If the pressure is lower or the level is insufficient, the engine is stopped and oil is added. When the engine reaches operating temperature, check the level once more and add oil to the maximum if necessary.

Changing the oil filter

While the oil circulates through the lubrication system, the filter removes particles from the oil that arise from various sources (carbon, metal chips, etc.). There are two types of oil filters, spin-on and cartridge.

The spin-on is a one-piece filter with a housing and a threaded base. It is removed with a special filter wrench and mounted exclusively by hand. The filter is supplied with a rubber sealing ring. Always make sure that the old sealing ring is removed as it often sticks to the engine block. If the new one is mounted over the old one, oil will leak during engine operation. When the spin-on filter is mounted over the surface of the sealing ring, a little oil is applied. In this way, it is lubricated by turning it together with the filter while tightening. An ungreased seal may fall out of the filter groove during tightening and oil may leak.

Exercise 4. Answer the questions.

1. What is an air filter used for?
2. Where can you find the information about the air filter replacement period?
3. What is the best way to check the air filter for dirt or blockage?
4. How often are the air filters changed?
5. Where are the air filters located?
6. What elements should be inspected and cleaned before installing a new filter?
7. What may happen if the filter is installed incorrectly?
8. What steps should be followed to replace the air filter?
9. When is the engine oil together with the filter changed?
10. What may the prescribed service interval be based on?
11. What is the function of the oil filter?

12. Why is it recommended to drain the oil from the engine when the engine is fully warmed up?
13. Where is the drain plug located?
14. What kind of drain plugs attracts metal chips?
15. Which seals are disposable?
16. Why are they changed?
17. What can damage the oil pan thread?
18. Which seals can be reused?
19. Why is it necessary to tighten the drain plug with the appropriate tightening force?
20. What procedures should be performed after pouring the recommended amount of the oil level?
21. What types of oil filters are available?
22. What is a spin-on filter?
23. How can the spin-on filter be removed?
24. What should be done with a used rubber sealing ring?
25. What damage may be caused by an ungreased seal?

Exercise 5. Read about a cartridge oil filter change. Match the steps (1-5) with their descriptions (a-e).

Information source: <https://autoedu.info/en/auto-mechanic/technical-maintenance/>

1. Draining the engine oil	a. While the oil is draining, loosen and remove the threaded oil filter with a filter wrench. Check that the filter seal is removed from the engine. Place the filter in the oil drain pan so that it can be drained. As it is a cartridge filter, remove the cover from the filter housing. Remove the filter cartridge and gasket.
2. Replacing oil filter	b. Before installing the drain plug, remove the sawdust if it is magnetic, wipe its threads and the sealing surface with a clean cloth. Place a new seal on the plug or an old one if it is reusable. Tighten the plug according to the manufacturer's recommendations. Remove the oil filler cap and slowly pour in the recommended amount of oil. The use of a funnel prevents oil from spilling on the engine. Check oil level, replace cover, start engine and allow to warm up. While the engine is running, check that there is no oil leaking on the plug and filter. Check the level and if it is insufficient stop the engine and top up. After warming up, switch off the engine, check the oil level again and top up, if necessary. Wipe off leaking oil on the engine and under the vehicle, and store drained oil and old filter properly.
3. Installing the filter	c. Warm up the engine. Raise the vehicle. Place a container under the oil drain plug in the oil pan. Loosen the drain plug with a suitable wrench. After releasing the drain plug, quickly remove it so that the oil can drain freely into the container.
4. Refilling oil	d. Enter the date, mileage and oil type in the service book. Reset the service interval of the oil change on the instrument panel as a reminder to the driver according to the instructions for the given vehicle.
5. Reset service interval	e. Confirm that you have the appropriate filter and seals. Clean the area where the filter fits. Spread a little oil over the surface of the sealing ring. Start turning the filter by hand and make sure that it cannot be pulled. Rotate the filter until it lightly touches the base. Tighten for other three-quarters to one turn. If it is a cartridge, clean the housing and insert the filter. Oil the seal, set it in place, install and tighten the housing cover.

Exercise 6. Mark the following sentences as True or False.

1. To loosen and remove the air filter housing cover it is necessary to unscrew the nut or release the fasteners. 2. To clean the air filter it is recommended to blow dirt out it with the air. 3. After installing a new air filter inside the housing a mechanic should check that it fits correctly. 4. When installing the threaded oil filter, it is necessary to take into account the correct grooving and tightening force. 5. A cartridge oil filter is a type of filter that has a reusable metal or plastic housing and a replaceable filter, a cartridge. 6. When the old oil filter is removed, the housing is cleaned and the sealing rings are replaced with new ones. 7. Gaskets made of plastic, aluminum, silicone or fiber are disposable.

Exercise 7. Read and translate the dialogue between a car mechanic and a customer. Act it out.

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 8. Search the Web for information about the types of air filters or about the meaning of the picture symbols/pictograms on the oil filters housing or packaging. Choose one of the options and make a presentation about it.

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. COMMERCIAL VEHICLE MAINTENANCE CHECKLIST

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

1. commercial vehicle коммерческое транспортное средство; грузопассажирский автомобиль для коммерческих перевозок; автомобиль, обслуживающий торговые предприятия

2. maintenance техническое обслуживание и текущий ремонт

3. checklist контрольный перечень (работ); контрольный список; карта технического контроля

4. maintenance checklist контрольный перечень операций по техническому обслуживанию, порядок технического обслуживания, регламент технического обслуживания, контрольный список технического обслуживания

5. downtime простой, вынужденное бездействие

6. malfunction неисправность

7. preventive maintenance program программа планового технического обслуживания и ремонта

8. reduce сокращать; снижать

9. operational costs эксплуатационные расходы
10. extend продлевать; увеличивать
11. lifespan срок службы
12. stay compliant with соблюдать; соответствовать
13. safety regulations правила безопасности; правила техники безопасности
14. paper-based бумажный вариант (документа), на бумажном носителе
15. electronic form электронная форма (документа); электронный бланк
16. item пункт, позиция (списка)
17. truck грузовой автомобиль, грузовик
18. mechanic механик
19. relevant parties соответствующие службы; иной персонал, имеющий отношение к данной сфере деятельности
20. reliable безотказный, надёжный
21. usage pattern статистическая характеристика интенсивности использования транспортного средства
22. paperwork бумажная работа; делопроизводство; работа с технической документацией
23. logistics организация и технология перевозок
24. backup резервное копирование; создавать резервную копию
25. store хранить, сохранять
26. fleet парк (автомобилей); автомобильное хозяйство; автотранспортная фирма
27. app(s) приложение, прикладная программа
28. tablet планшет
29. on-site на рабочем месте
30. remotely удаленно
31. Internet connectivity подключение к Интернету
32. sync синхронизировать
33. central database централизованная база данных
34. transport business бизнес, оказывающий транспортные услуги; бизнес, связанный с грузоперевозками
35. schedule составлять график; планировать
36. repair ремонт; ремонтировать
37. transportation транспортировка; перевозка; доставка
38. breakdown авария; поломка
39. run business вести дело; управлять бизнесом; руководить предприятием
40. smoothly гладко; бесперебойно; успешно
41. save экономить, беречь
42. fundamental element основной элемент
43. successful успешный, эффективный
44. preventive maintenance планово-предупредительный ремонт; плановое техническое обслуживание и ремонт; планово-предупредительное техническое обслуживание
45. value полезность; польза; выгода
46. anticipate определять и предупреждать (поломку)
47. fix ремонтировать, чинить; устранять (неполадки)
48. severe серьезный
49. manufacturer's recommendations рекомендаций изготовителя
50. approximate time примерный срок; ориентировочное время

51. specification спецификация; техническая характеристика; технические условия
52. oil change замена масла
53. filter change замена фильтра
54. components tightening подтягивание компонентов, элементов, деталей и узлов
55. tuning of the engine регулировка двигателя
56. brake fixing проверка и регулировка тормозов
57. tire rotation перестановка шин
58. lubrication смазка
59. radiator maintenance техническое обслуживание радиатора
60. demand maintenance техобслуживание по заявке
61. replacing замена
62. part элемент; деталь; узел; компонент; запчасть
63. break down выходить из строя, ломаться
64. stop working properly повреждаться; не срабатывать; работать с перебоями; переставать действовать; отказывать
65. independent независимый
66. wear and tear износ; амортизация
67. light bulb лампочка
68. spring пружина; рессора
69. window glass оконное стекло
70. retuning gauges (пере)настройка датчиков
71. seat cushion подушка сиденья
72. engine двигатель; мотор
73. transmission коробка передач; трансмиссия
74. battery аккумулятор; (аккумуляторная) батарея
75. corroded ржавый; проржавевший; разрушенный коррозией; корродированный
76. deteriorating structure конструкция с ухудшающимися характеристиками
77. crisis maintenance ремонт в случае внезапной поломки
78. slip by прозевать; пропускать
79. never happen не проводиться
80. sudden failure внезапный отказ
81. delivery point место выгрузки, место поставки
82. dispatch отправка; посылать; отправлять
83. on the spot немедленно, незамедлительно; на месте (событий)
84. additional costs дополнительные расходы
85. reroute изменять маршрут, перенаправлять
86. delivery поставка, доставка
87. hire an outside mechanic привлекать внешнего специалиста-механика; нанимать механика на стороне
88. in-house внутри фирмы; внутренний, собственный; штатный
89. purchase покупка; приобретение
90. damaged повреждённый, испорченный
91. record запись; регистрация, учётно-отчётные данные; отчёт; записывать; регистрировать
92. record-keeping ведение протокола; ведение записей; регистрация
93. up-to-date program отредактированная программа, отлаженная программа; современная программа
94. form форма; бланк

- 95. stay current быть актуальными
- 96. meaning(ful) data значащая информация
- 97. identify clearly устанавливать, точно определять
- 98. review обзор, анализ; оценка, проверка; экспертиза
- 99. eventual возможный, могущий случиться; эвентуальный, возможный при соответствующих условиях
- 100. management руководство; руководящий персонал; администрация; дирекция
- 101. additional work дополнительная работа, доработка
- 102. unsolved problem нерешенная проблема, нерешенный вопрос
- 103. equipment оборудование; приборы; устройство; оснащение
- 104. unknowingly ignore игнорировать по незнанию/неосознанно

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

Commercial, electronic forms, business, preventive, program, mechanic, functioning, transport, manager, transportation, logistics, specific, special, smartphone, internet, central, transport companies, fundamental element, service, type, recommendation, specifications, typical, filter, component, rotation, radiator, stop, inspection, situation, transmission, battery, corroded, structure, crisis, organize, procedure, identify, periodical, personnel, regularly, systematically inspect, problem, analyze, document.

Exercise 3. Read and translate Text 1.

Text 1. Commercial Vehicle Maintenance Checklist: How Electronic Forms Reduce Your Fleet Downtime

Source: <https://www.doforms.com/commercial-vehicle-maintenance-checklist/>

Vehicle downtime caused by malfunction costs your business anywhere between \$448 to \$760 per day! But did you know that you can reduce your downtime by 20% just by introducing a simple preventive maintenance program? Commercial vehicle maintenance checklists help businesses reduce their operational costs and vehicle downtime, extend vehicles' lifespan and help you stay compliant with safety regulations.

Commercial vehicle maintenance checklist is a paper-based or electronic form that consists of items that truck drivers, mechanics and other relevant parties must inspect in order to ensure reliable functioning of a commercial vehicle. Commercial vehicle maintenance checklists differ depending on the particular vehicle and usage pattern.

Using electronic maintenance checklist forms reduces a huge amount of paperwork and logistics to simple files that you can backup and store either locally or on a cloud. An electronic commercial vehicle maintenance checklist can be created according to specific business' needs and capacities, its fleet of vehicles and the number of drivers with the help of some special apps. Data can be collected on smartphones or tablets. Drivers, mechanics and managers can fill such checklists forms on-site or remotely, without internet connectivity required. The data in the checklists can be synced with the business' central database.

Commercial vehicle maintenance checklists allow transport businesses and fleet managers to schedule maintenance and repairs before the vehicles leave for transportation duties and, in doing so, avoid breakdowns. They also make sure transport companies run their business smoothly and save time, money and effort.

When making your checklist, consider these four fundamental elements that determine how successful your vehicle maintenance will be.

1. Preventive Maintenance Checklist

A preventive maintenance program helps enterprises get the most value and service out of the vehicle. This type of commercial vehicle maintenance tries to anticipate issues

before they occur and plan how they should be fixed before they turn severe. The preventive maintenance checklist and program should, therefore, include the manufacturer's recommendations on vehicle maintenance and the approximate time when persons responsible should perform it. The rest of the truck maintenance checklist will differ depending on the type of vehicle and its specifications.

Some of the typical items on preventive maintenance checklist include:

- Oil changes
- Filter changes
- Components tightening
- Tuning of the engine
- Brake fixing
- Tire rotation
- Lubrication
- Radiator maintenance

2. Demand Maintenance Checklist

Demand maintenance is the type of maintenance that transportation businesses perform only when there is a need for it. This means replacing or fixing certain truck parts only when they break down and stop working properly. This can also happen after an independent inspection that determines the wear and tear situation on a truck.

Demand maintenance forms usually include items such as:

- Replacing light bulbs
- Replacing springs
- Putting new window glass
- Retuning gauges
- Placing new window glasses
- Replacing seat cushions
- New engine and transmission
- New batteries
- Replacing corroded or deteriorating structures

3. Crisis Maintenance Checklist

Crisis maintenance usually occurs when preventive and demand maintenance slip by and never happen. This is the type of maintenance that is performed when a truck breaks down on the road due to the sudden failure of one or many components. This usually means sending a replacement vehicle so that the driver can continue his trip to the delivery point and dispatching a mechanic to repair the vehicle on the spot.

Businesses should try and avoid having to go through crisis maintenance because they incur the additional costs of:

- The time needed to organize necessary repair procedure and reroute deliveries.
- Driver's downtime.
- Hire of an outside mechanic, if the business doesn't have one in-house.
- Purchase of new parts to replace damaged ones with.

4. Maintenance Form Records

The three types of commercial vehicle maintenance above underline the importance of having an up-to-date record-keeping program that checklist records can provide.

Maintenance checklist forms must stay current, record meaningful data, identify the vehicle clearly and go through periodical reviews.

Commercial vehicle maintenance forms inform the driver, mechanic and other relevant personnel to regularly and systematically inspect the vehicle by looking up any eventual problems contained in the form. These forms should also keep records of preventive

maintenance and repair work that any of these parties have already performed on a truck. The transport business management can analyze the maintenance work contained in a checklist to establish whether there is a need for additional work. These records can also document any unsolved problems, the sources of said problems and the reason why they're not solved. They can also identify equipment that a driver may have unknowingly ignored.

Exercise 4. Answer the questions.

1. How is it possible to reduce the vehicle downtime caused by malfunction?
2. How can commercial vehicle maintenance checklists help businesses?
3. What is a commercial vehicle maintenance checklist?
4. What can transport businesses and fleet managers use these checklists for?
5. What are the benefits of using electronic maintenance checklist forms?
6. What fundamental elements of the successful vehicle maintenance should be considered when making a checklist?
7. What is a preventive maintenance program needed for?
8. What does a preventive maintenance checklist include?
9. What items does the preventive maintenance checklist consist of?
10. What is demand maintenance?
11. What items do demand maintenance forms comprise?
12. What is crisis maintenance?
13. Why do businesses should avoid crisis maintenance?
14. What are the requirements for maintenance checklist forms?
15. What is the function of commercial vehicle maintenance forms?
16. What records should be kept in these forms?

Exercise 5. Read about the aspects included in the most effective and thorough checklists of a preventive maintenance form. Match the items (1-7) with their descriptions (a-g).

Information source: <https://www.doforms.com/commercial-vehicle-maintenance-checklist/>

1. Main technical inspection	a. Checking and testing the entire brake system; measuring the brake pads width and replacing them if they are under the sufficient width; checking the emergency brake
2. Fluids and oils inspection	b. Taillights and brake lights, high and low beams, turn signals, reverse lights, emergency flashers, license plate illumination
3. Brakes inspection	c. Engine, transmission, filters, fuel level, suspension system, steering system, belts and hoses, auxiliary systems, body, clutch, electrical system components and exhaust system
4. Lights inspection	d. Power steering fluid, brake fluid, wiper fluid, transmission fluid, oils and defrosting system
5. Wheels and rims inspection	e. Integrity of glass, window control system, wiper system, driver and passenger side mirrors, inside mirrors
6. Interior inspection	f. Check whether the tire matches the wheel; wheel alignment; tire conditions and whether there are any embedded objects and cuts; spare tires; check for availability of tools needed to change a tire in case of emergency
7. Windshield, back windows and mirror inspection	g. Air conditioning system; checking if the horn is working and if it's loud enough; seat belts; gauges; fan; check for emergency and first aid kit availability, as well as a fire extinguisher, warning triangle, reflective jacket etc.

Exercise 6. Mark the following sentences as True or False.

1. Commercial vehicle maintenance checklist forms help freight companies keep their fleet of vehicles in good technical condition, safe and reliable for the transport of goods and services to retailers and consumers. 2. There are three types of checklists depending on the type of maintenance and situation that requires them: a preventive maintenance checklist, a demand maintenance checklist and a crisis maintenance checklist. 3. The downtime of an inoperative vehicle allows a transportation company to reduce costs. 4. Only electronic maintenance checklist forms are available nowadays. 5. Demand maintenance is performed when a truck breaks down on the road due to the sudden failure of one or many components. 6. Commercial vehicle maintenance checklists are for drivers, mechanics and other relevant personnel.

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

Mechanic 1: What was the trouble with this car?

Mechanic 2: An increased oil consumption.

M. 1: Let's review what you did before it will be back to the route.

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. The car has been used rather intensively.

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 manager and tell him that the car is ready.

Exercise 8. Search the Web either for the business and road safety benefits of the preventive maintenance vehicle checklists or the way how to create an electronic commercial vehicle maintenance checklist. Choose one of the options and make a presentation about it.

Exercise 9. 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. DIGITAL TRANSFORMATION IN TRANSPORTATION AND LOGISTICS

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

1. digital transformation цифровое преобразование
2. transportation транспортировка; перевозка; доставка
3. logistics логистика; система поставок; организация и технология перевозок
4. interconnected взаимосвязанный; объединённый
5. transportation industry транспортная отрасль

6. improve улучшать, повышать качество; совершенствовать
7. service услуги; обслуживание; сервис; работа
8. commute ездить на работу в город (о жителе пригорода)
9. management управление; руководство; организация работы
10. cargo груз
11. cost-effectively с оптимальными затратами, экономически эффективно
12. complex supply chain structure сложная структура цепочки поставок
13. compel заставлять, вынуждать
14. transporter перевозчик; компания, осуществляющая транспортировку
15. forefront лидирующий
16. forerunner предвестник
17. lagging behind находиться в числе отстающих
18. reluctant сопротивляющийся
19. shift изменение; перемена
20. imminent надвигающийся, неотвратимый, неизбежный, неминуемый
21. advancement улучшение, развитие
22. reshaping преобразование; перестройка
23. item изделие; товар; единица оборудования
24. administration управление; ведение (дел), администрирование
25. plan of action план действий
26. utilize использовать
27. business process бизнес-процесс
28. user experience опыт (квалификация, ментальность, поведенческие особенности) типичного пользователя
29. meet necessities отвечать потребностям и требованиям
30. organizational организационный
31. arguably возможно, вероятно
32. mindset склад ума, (привычный) образ мыслей, тип мышления
33. execute выполнять, делать; реализовать; доводить до конца
34. workforce рабочая сила, персонал
35. on board в числе участников; в числе сторонников
36. internally внутри (компании)
37. take time and effort требует времени и усилий
38. employee сотрудник; работник
39. smoothly гладко; спокойно; беспрепятственно, без помех
40. process automation автоматизация процесса
41. manually ручным способом, вручную
42. machine learning устройство со средствами самообучения, машинное самообучение (способность устройства увеличивать свою производительность, эффективность или другие аспекты работы на базе предшествующего опыта); обучение машин
43. robotic роботизированный
44. big data большие данные (набор технологий, включающих системы хранения и обработки огромных массивов структурированных и неструктурированных данных разнообразного состава, часто обновляемых и поступающих из различных источников, обрабатываемых в целях увеличения эффективности бизнеса, создания новых продуктов и повышения конкурентоспособности)
45. big data analytics анализ больших данных
46. API (Application Programming Interface) интерфейс прикладного программирования

47. reduce сокращать, уменьшать
48. processing time время обработки (данных)
49. enhance улучшать; повышать
50. performance производительность; эффективность; качество работы
51. data-driven управляемый данными, с управлением данными
52. business model модель предприятия; бизнес-модель
53. customer покупатель; потребитель; заказчик; клиент
54. communications коммуникация, взаимодействие, передача данных (информации); общение, деловые контакты; коммуникабельность
55. domain область; сфера; поле деятельности
56. streaming потоковый режим передачи и обработки данных; организация потокового режима
57. budding stage фаза зарождения
58. adjacent niches смежные ниши
59. lay the groundwork for подготавливать почву для
60. continuous growth непрерывный рост
61. trend курс, направление, тенденция
62. cloud computing облачные вычисления, вычисления в облаке; вычисления при помощи Интернет-ресурсов
63. keeping хранение; сохранение
64. cost-effective доходный, прибыльный, рентабельный
65. secure безопасный, надёжный
66. access доступ; иметь доступ, получить доступ (к чему-л.)
67. real-time data данные, поступающие в реальном (масштабе) времени
68. blockchain технология распределённых реестров; блокчейн
69. integration объединение в одно целое, интеграция
70. multiple systems многоэлементная система; система с параллельным включением
71. internet of things (IoT) интернет вещей (физических объектов, предметов, продуктов), интернет-технология вещей (объектов)
72. solution решение
73. barcode scanner сканер штриховых кодов
74. RFID (Radio Frequency Identification) радиочастотная идентификация
75. RFID sensor радиодатчик, RFID-датчик
76. asset management управление активами
77. warehouse склад; складское помещение
78. supply cycle цикл поставок
79. wearable (device) носимое устройство (напр., микродисплей, вмонтированный в очки)
80. health-related лечебно-оздоровительный
81. accident несчастный случай; катастрофа; авария
82. fully operational полностью работоспособный
83. mental state психическое состояние; умственное состояние
84. drone дрон; беспилотный самолёт обычно с дистанционным управлением
85. autonomous vehicle автономный (самоуправляемый) автомобиль; автомобиль без водителя
86. small-distance delivery доставка на малые расстояния
87. surveillance осмотр; обследование; наблюдение
88. warehouse stock складские запасы; товар на складе

89. autonomous truck самоуправляемый грузовой автомобиль
90. forklift вилочный подъёмник; погрузчик с вилочным захватом
91. robot arm рука робота; роботизированная рука
92. collect data собирать данные
93. high-level analytics аналитика высокого уровня
94. insight понимание, способность разобраться в существе вопроса; адекватная самооценка
95. operation деятельность, работа
96. predict прогнозировать
97. meet удовлетворять, отвечать, соответствовать
98. demand спрос; потребность; требование
99. adjust налаживать, регулировать; отлаживать
100. supply chain цепочка поставок, сеть поставщиков; канал поставок
101. artificial intelligence искусственный интеллект
102. repository репозиторий; репозитарий (корпоративная база данных); хранилище; архив; система хранения
103. department отдел; отделение; управление; служба
104. unit подразделение
105. get rid of избавляться
106. transparent прозрачный
107. predictive model прогнозирующая модель
108. efficiency эффективность, результативность
109. computer vision машинное зрение, техническое зрение (направление искусственного интеллекта, занимающееся обработкой и распознаванием динамических изображений реальной действительности)
110. subset вариант; разновидность
111. adequately компетентно, адекватно
112. photos and videos shot фотоснимки и видеозаписи
113. use case прецедент, вариант использования, сценарий использования
114. virtual assessment виртуальный анализ; виртуальная оценка
115. vehicle damage повреждение транспортного средства
116. natural language processing (NLP) обработка естественного языка, обработка текстов на естественном языке (ветвь вычислительной лингвистики (computational linguistics), которая занимается проблемами использования компьютера для распознавания естественного языка, представленного в виде речи или текста)
117. eCommerce (electronic commerce) электронная торговля, электронная коммерция (коммерческая деятельность, осуществляемая через интернет)
118. consumer-facing ориентированный на прямое взаимодействие / работу с потребителями
119. customer support обслуживание клиента
120. chatbot чатовый робот, чабот (разновидность робота, который может участвовать в чатах)
121. tool средство; механизм, способ
122. application применение, использование
123. invoicing выставление счёта-фактуры, инвойсирование
124. financial processes финансовые процессы
125. error ошибка, погрешность
126. financial documentation финансовая документация
127. digital twin цифровой двойник; виртуальная копия

128. lovechild возникший, существующий вопреки правилам, обычному порядку; официально непризнаваемый
129. digital copy цифровая копия
130. simulation моделирование; воспроизведение, имитация
131. possible scenario возможный сценарий
132. assess risks оценивать риски
133. build strategy строить стратегию
134. make data-backed decisions принимать обоснованные решения

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

Globalization, transportation industry, service, logistics organization, management, effectively, technology, progress, business, complex, structure, components, transformation, global, historically, logistics companies, start, definition, administration, plan, computerized innovation, system, business processes, culture, type, organizational transformation, cultural transformation, paradigm, transformation process, automation, machine, robotic process automation, analytics, cycle, business model transformation, partner, communication, online, niche, moment, tech, real, integration, platform, specialist, evolution, Internet, scanner, sensor, drone, autonomous, distance, locally, control, repositories, department, confidential, efficiently, efficiency, computer, adequately, analyze, object, photo, video, camera, virtual, natural, commerce, optimizing, chatbot, invoicing, financial process, revolution, financial documentation, copy, simulation, scenario, risk, strategy.

Exercise 3. Read and translate Text 1.

Text 1. Digital Transformation in Transportation and Logistics: Types and Trends

Sources: <https://www.yoh.com/blog/5-trends-of-digital-transformation-in-transportation-and-logistics>, <https://themindstudios.com/blog/digital-transformation-for-logistics/>

With the world getting more interconnected under globalization, the transportation industry is under pressure more than ever before to improve its services. Everybody needs a smooth, free from any danger experience whether they are moving casually or commuting for a job. Along with that, expectations from logistics organizations have also increased.

Transportation management is not anymore about moving cargo cost-effectively. The technology has progressed, and the businesses have expanded. The current complex supply chain structures and numerous components are compelling transporters to improve their management and services to succeed in the market.

Surprisingly, digital transformation in logistics wasn't at the forefront of the global change trends until just recently. An industry historically known to be a forerunner of innovation is lagging behind today. A lot of logistics companies are reluctant to change and continue to do things the old ways. However, the shift is already imminent.

Let us start with the definition of digital transformation. Digital transformation is the advancement and reshaping of items, administrations, and whole plans of action by computerized innovations. It is the way towards utilizing technologies to make new or make changes to an existing system, business processes, culture, and user experience to meet changing business and market necessities.

Digital transformation in logistics can be of four main types.

1. Organizational transformation: Arguably, the most important part of the transformation process is the internal mindset change. Organizational transformation is sometimes also referred to as cultural transformation, and it's exactly what it is. To successfully execute

digital transformation in your logistics company, you'll need to bring your workforce on board, and implement digital solutions internally before you do it externally. Changing the whole paradigm and the way you've been doing things might take time and effort. However, with the support and understanding of your employees, the success rate will go up considerably, and the transformation process will go much more smoothly as well.

2. Process automation: The second type of digital transformation in transportation and logistics is process automation. It means employing digital technologies for tasks previously managed manually. The list of possible technologies is quite long; we'll only list the most major ones: machine learning, robotic process automation, big data analytics and APIs. The use of technology can reduce processing times, shorten cycles, and enhance business performance through data-driven decisions.

3. Business model transformation: When you want to do more than implement a number of digital solutions and your plan is complete transformation in your logistics business, there's this type. Business model transformation is a major change in the way you deliver value to customers and partners. This is where the changes to your communications go, among other things.

4. Domain transformation: You know how Amazon went from an online bookstore to what we know today? Or how Netflix changed its operations when streaming was only at its budding stage? This is domain transformation – the changes implemented to spread into adjacent niches, to grow across domains. This will allow your business to grow not just at the moment but to lay the groundwork for continuous growth opportunities in the future.

As to tech trends in transportation and logistics digital transformation, here are the technologies to consider when you decide to go through logistics and transportation digital transformation:

1. Cloud computing: Keeping your data in the cloud is cost-effective, often more secure, and, for the logistics industry, it allows profitable and simple access to real-time data.

2. Blockchain: It is probably the most heard about technology in the industry as it allows faster and more secure integration of multiple systems into one platform. Some specialists call blockchain the evolution of cloud computing.

3. Internet of Things (IoT): Employing barcode scanners and RFID sensors for asset and warehouse management will shorten supply cycles; using wearable health-related IoT solutions for employees will lower the number of accidents and help keep your workforce fully operational (and probably in better mental state).

4. Drones and autonomous/smart vehicles: These tech solutions can perform a range of actions, from small-distance delivery (inside a warehouse or locally to customers) to surveillance and control over warehouse stock. For example, there's a known case where drones equipped with barcode scanners collected data on items in the warehouse. Autonomous vehicles have taken a significant part of the logistics, and that day is not far away when we would see the whole transportation process fully autonomous. Although autonomous trucks haven't been introduced in the supply chain to transport goods, we see forklifts quite commonly used in warehouses, air terminals and ports, etc., robot arms in warehouses.

5. Big Data: It brings high-level analytics and insights into your operations, can help predict and meet demand, adjust your supply chain, and overall enhance your business performance.

6. Machine learning (ML) and artificial intelligence (AI): Most companies that have been on the market for a while have data repositories controlled by a certain department or unit. Such data is usually hard to access across units despite it is not always confidential. By employing AI and ML, it's possible to get rid of such silos, thus building more transparent operations. AI/ML with the help of Big Data can also efficiently build predictive

models for operation efficiency.

7. Computer vision: A subset of artificial intelligence and machine learning, computer vision is a technology that allows computers to adequately analyze and assess objects through photos and videos shot with a camera. Use case in logistics – virtual assessment of vehicle damage.

8. Natural Language Processing (NLP): NLP is becoming widely used in eCommerce and other consumer-facing businesses as a tool for optimizing customer support via chatbots, but that's not its only application. A logistics and transportation business can employ NLP for its invoicing and financial processes. As another part of the AI revolution, NLP-powered systems can reduce the number of errors in financial documentation.

9. Digital twin: The lovechild of Big Data, AI/ML, and cloud computing/blockchain technology, a digital twin is basically a digital copy of your business used for simulations of possible scenarios. It can be used to assess risks, build strategy, and make data-backed decisions faster.

Exercise 4. Answer the questions.

1. Why does the transportation industry have to improve its services?
2. What does transportation management include?
3. How is digital transformation defined?
4. What are the main types of digital transformation in logistics?
5. Why is organizational transformation also referred to as cultural transformation?
6. What does process automation imply?
7. What does business model transformation mean?
8. What is domain transformation?
9. Which tech technologies can be used for logistics and transportation digital transformation?
10. How can cloud computing be applied in the logistics industry?
11. What are the advantages of blockchain?
12. What are the examples of the Internet of things solutions?
13. How drones and autonomous vehicles can be used?
14. How can Big Data improve the business performance?
15. What improvements can be made with the help of machine learning and artificial intelligence?
16. What does computer vision allow computers to do?
17. How can a logistics and transportation business employ Natural Language Processing?
18. How can a logistics company make use of a digital twin?

Exercise 5. To find out if your logistics business needs a digital transformation, you should answer the following questions. Match the questions (1-5) with the explanations (a-e).

Information source: <https://themindstudios.com/blog/digital-transformation-for-logistics/>

1. Is your business challenging to keep up with competitors?	a. When your business is small and there aren't all that many customers, manual transaction processing is no big deal. But when your logistics business grows, the number of transactions and sometimes the amount of money in them becomes hard to handle. Human error is no trifle matter for medium-sized businesses, let alone big ones. Automated processing, when done right, offers: higher efficiency, fewer errors, higher speed, lower costs and higher transparency and
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	audit ability. Modern processing systems employ custom algorithms and, if necessary, machine learning to make the process seamless even in the most varied situations.
2. How much time and effort do you spend on processing transactions?	b. Real-time tracking is a must these days for a successful logistics business, although there are several ways to go with this feature. You can track your fleet vehicles and track each package you deliver. The former is easier to accomplish than the latter since you'll only need a tracking app on your drivers' work smartphones or a GPS location tag on your vehicles. The latter will require the use of Radio Frequency Identification (RFID) sensors and a system for tracking them. Depending on the type of your logistics business, you might benefit more from the second type of app, though, as you'll be able to track missing or misplaced items faster. With either of the aforementioned options, you can choose between building your own app or using a Software-as-a-Service (SaaS) solution. In an app of your own, you can have more than just tracking. Consider adding digital signatures and payment-upon-delivery for faster processing and enhanced user experience.
3. Are your operations and asset tracking efficient?	c. The first sign that your business requires some kind of change is when you start lagging behind competitors in sales, losing old clients, or not getting new ones at the old pace. In this case, you'll probably do research to see what it is that your rivals offer. Chances are they've done a digital transformation either externally or internally (or both).
4. Do you offer your clients real-time delivery tracking?	d. For a non-digitized business, collaboration and communication with digitized business partners and clients will pose some challenges. Manual sorting of inquiries and invoicing can take quite a bit of time, making your partners and clients impatient and worsening their experience with your business. People these days are used to instant replies, chatbots instead of emails, and digital invoices. And one of the major parts of digital transformation in the transportation and logistics industry is replacing old communication methods with modern ones.
5. Is your communication effortless?	e. How is your customer satisfaction doing? Asset and operation tracking inside your business has a direct effect on how quickly and efficiently you manage orders, which, in turn, affects your customers' experience with your company. Instead of manual book-keeping and asset management, you can implement an automation solution as part of your logistics digital transformation. Same as with transaction processing, a proper centralized system for internal operations and warehouse management will help your business respond more swiftly to orders, manage feedback, and react to complaints.

Exercise 6. Mark the following sentences as True or False.

1. Logistics is a leading industry in digital transformation. 2. Digital transformation in logistics includes organizational, business model and domain transformations as well as process automation. 3. Natural language processing helps the logistic companies to keep a check on the financial processing. 4. Autonomous trucks have been introduced in the supply chain to transport goods. 5. Both machine learning and artificial intelligence allow

companies to build more transparent operations. 6. Cloud computing helps organizations in real-time vehicle tracking.

Exercise 7. Work in pairs. Read and translate a dialogue between a digital transformation expert and an interviewer. Act it out.

Information source: <https://www.yoh.com/blog/5-trends-of-digital-transformation-in-transportation-and-logistics>

Interviewer: Today we are going to talk about digital transformation in transportation and logistics. So, what are the current trends in this area?

Expert: There are a lot of them but I think we should take a look at the main ones. I mean blockchain, cloud-based systems, internet of things, autonomous vehicles and visibility.

I.: I know that blockchain is one of the most amazing trends. It helps companies to make the customers' experience better by providing them with transparency. This enables them to communicate and see the whole journey of the product.

E.: Exactly. And blockchain in logistics assists with checking the history of carriers and various suppliers. The decentralized technology of blockchain can ensure the secure exchange of information and finances with the help of smart contracts by reducing the chances of fraud or cheating, staying away from bottlenecks and botches. Thus, it can save both time and costs!

I.: Great! And what about cloud-based systems? I mean cloud technology is widely used nowadays in different industries.

E.: Yes, and it is one of the biggest trends in the transport industry, too. By including cloud-based technology in transportation and logistics management, organizations can achieve operational efficiency. Cloud computing helps organizations in real-time vehicle tracking, logistics space planning and management of online ticketing.

I.: Sounds interesting! And how can internet of things improve the logistics and transportation?

E.: Well, the web-powered gadgets enable the smart gathering of information, and the IoT sensors can alert vehicles and trucks of possible obstructions ahead during the transit. Also, these sensors can help observe the space a particular package takes. This data can be used to calculate the shipment cost. Moreover, drivers utilizing IoT can monitor fuel usage, brake efficiency and speed.

I.: Talking about drivers... I've heard about self-driving trucks. Many experts suggest that autonomous cars will become fully available in the next decade.

E.: I partly agree. I mean, on the one hand, it's one of the leading transportation trends and I'm sure the whole transportation process will be fully autonomous one day. On the other hand, the innovation for self-driving trucks is immature. For example, it needs to overcome certain hurdles, improving driverless programming to make it ready to work on urban streets with heavy traffic efficiently. Besides, it should be noted that the introduction of autonomous vehicles in the logistics process will require approval and legislation changes.

I.: I see. And now let's consider the final trend. It's visibility. The success of current transport and logistics management is centered around the idea of visibility. But can you give us an example of use case?

E.: Yes, sure. One of the recent developments in this domain is the introduction of Anti-theft GPS, which has made it possible to reach the truck fleet's live location. This technology is saving organizations from huge losses.

I.: Thank you very much for a very interesting talk.

Exercise 8. Search the Web for different aspects that a digital transformation strategy involves (e.g., research, analysis of the business, thorough planning, budgeting, digital transformation mindset, etc.). Make a presentation about it.

Exercise 9. 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. HOW TO START AN AUTO REPAIR SHOP: EQUIPMENT AND PREMISES

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

1. auto repair shop авторемонтная мастерская
2. equipment оборудование; оснащение
3. premises помещение
4. profitable выгодный, рентабельный
5. workshop мастерская; цех
6. highly skilled высококвалифицированный
7. versatile с богатым практическим опытом; специализирующийся в различных сферах ремонта
8. mechanic механик
9. restricting ограничительный, сдерживающий
10. run руководить, управлять; вести (свой собственный бизнес)
11. have a good knowledge хорошо знать
12. use использовать, пользоваться, применять
13. maintain поддерживать, сохранять (в рабочем состоянии); обслуживать; содержать в исправности
14. automotive equipment company компания, продающая автомобильное оборудование
15. owner's manual руководство пользователя; инструкция для владельца
16. operating manual руководство по эксплуатации
17. service instruction инструкция по эксплуатации; *мн. ч.* правила эксплуатации
18. heavy equipment тяжеловесное оборудование; специальная техника
19. purchase покупка; покупать; приобретение; приобретать
20. lease лизинг; аренда; арендовать; брать в аренду
21. training обучение; инструктаж; подготовка; тренинг
22. operate работать; управлять; эксплуатировать
23. machine станок; аппарат; механизм; устройство
24. safely безопасно
25. for free бесплатно
26. on-site у заказчика, на объекте заказчика, на месте установки; на месте эксплуатации (системы, оборудования); на рабочем месте
27. employee сотрудник; работник
28. skills навыки; умение; практический опыт
29. customer service служба работы с клиентами
30. paramount первостепенный, наиважнейший
31. caring внимательный
32. helpful любезный, предупредительный
33. prerequisite необходимое условие
34. right правильный; верный; подходящий

- 35. mechanical repair ремонт автомобиля
- 36. servicing сервис; техническое обслуживание; уход; текущий ремонт
- 37. tool инструмент; прибор; приспособление; устройство
- 38. broad range широкий спектр; целый комплекс; большое число
- 39. cost range диапазон цен, диапазон затрат
- 40. set up учреждать; основывать, открывать (дело, предприятие и т. п.)
- 41. lift подъёмник
- 42. building lease аренда земельного участка для застройки
- 43. painting the floor покраска пола
- 44. signwriting установка указателей
- 45. patience терпение, терпеливость, настойчивость
- 46. machinery механизмы
- 47. high-quality высококачественный
- 48. run smoothly работать бесперебойно; проходить гладко
- 49. profit centre центр прибыли (филиал или подразделение компании, которое напрямую увеличивает прибыльность корпорации)
- 50. turnover оборот; производительность
- 51. safety безопасность
- 52. recharge подзаряжать; перезаряжать; подзарядка
- 53. skim проточить (тормозной диск)
- 54. wheel колесо
- 55. align выравнивать; центрировать
- 56. wide and deep свободный и широкий
- 57. access подъезд; въезд
- 58. hoist подъёмный механизм, подъёмник
- 59. rolling jack подкатной домкрат
- 60. sideways в сторону
- 61. backward назад
- 62. forward вперёд
- 63. high ceilings высокие потолки
- 64. solid concrete floor твердый бетонный пол
- 65. accommodate размещать; вмещать
- 66. clear-floor hoist подъёмник с верхней синхронизацией (чистый пол)
- 67. concrete floor бетонированный пол; бетонное покрытие
- 68. steel-reinforced армированный сталью
- 69. solidly основательно; надёжно; прочно
- 70. mount устанавливать; монтировать
- 71. facilities оборудование; приспособления
- 72. natural light естественное освещение
- 73. stain пятно; потёк
- 74. cylinder block блок цилиндров
- 75. fluid leaks утечки жидкости
- 76. hard-to-see трудноразличимый
- 77. indicator признак
- 78. underlying расположенный внизу
- 79. fault неисправность
- 80. split разрыв; трещина
- 81. damage повреждение; дефект, поломка
- 82. hose шланг

83. engine двигатель; мотор
84. gearbox коробка передач
85. visual signs визуальные признаки
86. coat слой
87. gloss глянец; глянцевое покрытие
88. withstand устоять, выдержать; не поддаваться
89. oil масло
90. level ровный; твёрдый, устойчивый
91. upright стойка
92. skidproof нескользящий
93. nonskid paint шероховатая краска
94. rules and regulations правила и нормативы
95. zoning распределение по зонам; зонирование; районирование (деление городского массива на жилые и промышленные зоны)
96. drainage водосбор; дренажная система; слив, сток; канализация
97. volatile летучий, быстро испаряющийся
98. legally по закону; законно; легально
99. electricity supply электрический источник; электроснабжение
100. wiring электропроводка; система проводов; проводная сеть
101. air hose шланг для подачи воздуха; воздухопровод
102. overhead навверху, вверху, над головой; на потолке
103. water line водовод
104. power point место подачи питания; штепсельная розетка; электрический ввод
105. properly должным образом; как следует; правильно
106. get knocked работать с перебоями
107. spill kit устройство сбора разлитой жидкости
108. emergency авария, аварийная ситуация
109. fire extinguisher огнетушитель
110. well-constructed plan продуманный план (действий)

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

Auto, business, start, mechanic, real, service instruction, company, training, mechanical, invest, centres, discs, function, maneuver, comfortable, office, toilet, lunch, fountain, natural, examine, cylinder block, indicator, result, serious, visual, factor, sprayed, finally, territory, region, inspect, zone, leasing, drainage, chemicals, associated, legal, electricity, volt, phase, special, basic, plan.

Exercise 3. Read and translate Text 1.

Text 1. How to Start an Auto Repair Shop

Source: <https://axleaddict.com/auto-repair/How-to-start-an-auto-repair-business-the-right-way>

With the right premises and equipment, opening an auto repair shop can be a profitable business. Starting your own automotive repair shop or workshop is any good mechanics' dream everywhere. If you are a highly skilled and versatile mechanic, you may find it to be very restricting working for someone else when you could be running your own business and making real money at the same time.

To open your own auto repair shop, you need to have the suitable premises for it. In addition to having the proper premises, the right equipment is essential to opening an auto shop. You should have a good knowledge of workshop equipment to make the right decisions about choosing and buying it, and you also need to learn how to use and maintain

different equipment correctly. A good automotive equipment company will ensure you have all owner's manuals and operating manuals as well as service instructions for all the heavy equipment you purchase or lease. The company should also be capable of providing any training necessary to operate each machine safely. Most will do so for free and on-site.

Employees' skills and customer service are paramount in this business. A caring, helpful personality as well as a love for your job are prerequisites when starting an auto repair shop the right way. If you care about your work, customers will care about using your workshop to do all their mechanical repairs and servicing. It means that you should also plan on having the right tools and equipment to do a broad range of services.

In western countries, between \$20,000 and \$100,000 is the usual cost range for setting up a small shop to a larger operation with 4 lifts. You will need some cash for the building lease, painting your floor, signwriting, etc., and buying or leasing equipment. You need the patience to learn about choosing the right machinery and equipment. Whether you rent or buy, making sure that you have high-quality equipment. If you invest in high-quality equipment, it will make everything run more smoothly.

As to services you should offer, the more markets you can cover the better. So, having a wide range of profit centres provides better turnover and more profit safety. It's a good idea not only to provide a wide range of services but also free advice to keep customers in your shop rather than having to send them elsewhere to have their air-conditioning recharged, their discs skimmed, or their wheels aligned, etc.

In order for your workshop to function smoothly, the building needs to have the following features.

1. Wide and deep access: Customer's cars need room to drive in and out straight to get on and off hoists. Unless the building is very deep, there will be no room to align the vehicle with the hoist if access is too narrow. If space is very limited, you can use rolling jacks that sit under the tire to maneuver the vehicle by hand. These are quick and easy to use. If your floor is in good condition, the vehicle will roll sideways, backward or forward with just a gentle push.

2. High ceilings and a solid concrete floor: To accommodate the latest clear-floor hoists you need a high ceiling. A concrete, steel-reinforced floor is required to solidly mount the hoists onto.

3. Enough space, facilities and premises: The workshop floor area needs to accommodate at least 2 hoists. You may consider scaling up to 4-6 hoists when you have become comfortable with finding quality mechanics to work for you. Remember to ensure the building is deep enough so you can back each car off the hoist inside the building. The reception area, office, toilets and lunchroom need not be big, but should be neat and comfortable for both workers and customers. A water fountain is a good idea in both the reception area and lunchroom.

4. Good natural light: A good natural light source is a huge advantage to your mechanics, especially for examining stains on cylinder blocks left from fluid leaks and other hard-to-see indicators of underlying faults. A tiny split or damage to a hose could – if left unnoticed – result in engine or gearbox serious damage. All these important visual signs require good natural light. Good lighting is still one of the major factors missed in many auto repair shops. To increase natural light in your workshop, paint all walls bright white, with at least two coats. High-quality gloss is brighter than other surfaces and easier to keep clean.

5. A properly painted floor: The workshop floor is very, very important because it must withstand stains from dirty things and hot oil. It happens that spills do occur when doing oil changes. So, before you move your hoists in, you need to make sure that the floor is level, thick, strong and painted so that the oil does not soak into the concrete and

weaken it, especially around the hoist uprights. Ensure the painted floor surface is skid-proof and smooth to roll equipment on. You can do this by using nonskid paint that can be rolled on or sprayed.

Finally, let's have a look at rules and regulations. In most countries, states and territories, there are regulations defining areas where you can put a workshop. Here are a few more things to consider, though you should research regulations in your particular country and region.

- Inspect the zoning on any property you consider leasing or buying.
- Ensure you have correct drainage installed in case of large oil spills.
- Ensure that you can store volatile chemicals associated with your trade.
- Ensure you are able to operate all your machinery legally.
- The electricity supply for much workshop equipment is 400-volt 3-phase; ensure it is connected and working properly. It's important for the workshop equipment.
- Install air hoses overhead.
- Run an overhead waterline if you feel you'll need it for some special jobs you may do.
- Power points should be at the proper level so they do not get knocked, and you'll need plenty of them even for a basic workshop.
- Buy and maintain an emergency spill kit.
- Fit fire extinguishers to a well-constructed plan, ensuring they will be quick and easy to reach.

Exercise 4. Answer the questions.

1. What dream do most good mechanics have?
2. What do you need to open your own auto repair shop?
3. What does a good automotive equipment company offer to its clients together with the high-quality equipment?
4. Why are employees' skills and customer service of paramount importance?
5. How much does it cost to set up an auto repair shop?
6. Why should the auto repair shop provide a wide range of services?
7. What are the important features of a building for a workshop?
8. What are the examples of prevalent rules and regulations about opening an auto repair shop?

Exercise 5. Match the auto repair equipment (1-7) with their descriptions (a-g).

Information source: <https://jmcautomotiveequipment.com/blog/top-10-equipment-needs-for-opening-an-auto-repair-shop/>

1. Vehicle lift	a. This machine is fundamental for any garage or shop. Whether it's rebuilding, repairing or replacement of an engine, you need it for lifting this heavy part of a vehicle. Be sure to buy one that has the capacity to handle the largest engine you expect to service.
2. Air compressor	b. Services like changing oil and transmission fluid will need this type of a storage container with enough capacity to contain the largest fluid volume. The one that can reach the raised vehicle will make the job easier and quicker.
3. Jack, jack stands	c. If you're going to offer air conditioning service, get this machine. It will ease recovering, recycling, and recharging vehicle A/C systems. This will make flushing and diagnosing A/C systems faster and more reliable.
4. Battery charger	d. You will need this machine to operate many tools within your shop, including pneumatic hand tools and some auto lifts. Get the highest ca-

	capacity you can afford, to be sure you have the power you need for powering the needs of your shop – a good example would be a 60 or 120-gallon compressor.
5. Air conditioning machine	e. Many jobs in an auto repair shop will pertain to dead batteries or charging problems. Your shop will need this device and a jumper to handle these services.
6. Engine hoist	f. Every mechanic needs to get under the vehicles to perform essential inspections and diagnostics. Your shop will need this equipment to raise the vehicle to the height needed for these services.
7. Oil drain and oil cad-dy	g. Many auto repairs will require a device for lifting vehicles off the ground. The high-quality, high-capacity one for raising the axle of a motor vehicle off the ground so that a wheel can be changed or the underside of a car can be inspected will be utilized on a regular basis. Get strong jack stands to support the vehicle once they're elevated.

Exercise 6. Mark the following sentences as True or False.

1. The goal of many skilled auto mechanics is to open their own auto repair shop at some point in their career. 2. You need to purchase high-quality repair equipment to operate your workshop successfully. 3. You can put your workshop in any place you like. 4. The way your personnel treat the customers is not really important for your auto shop reputation. 5. For a hoist to be mounted solidly and safely you need to have a concrete, steel-reinforced floor in the workshop. 6. It is recommended to use a special paint for the floor in the workshop. 7. A spill kit is a must in any auto repair shop.

Exercise 7. Work in pairs. Read and translate a 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 8. Search the Web for tips about opening an auto repair shop in your region and make a presentation about it.

Exercise 9. 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. SPECIALIZED TOOLS FOR AUTO REPAIR SHOP

Exercise 1. Match the verbs in English from Text 1 (1-8) to their Russian equivalents (a-h).

1. tackle	a. повторно нарезать резьбу; прогонять метчиком повреждённую резьбу
2. wind back	b. повышать давление; герметизировать; нагнетать
3. rethread	c. разряжаться
4. strip	d. решать; браться
5. pressurize	e. подсоединить; включить
6. plug on	f. пригодиться
7. run down	g. утопить
8. come in handy	h. срывать резьбу

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

1. professional	a. компрессометр
2. upgrade	b. устройство видеоконтроля; видеоизмерительный прибор
3. cylinder compression tester	c. тестирование компонентов; покомпонентное тестирование
4. Autodata	d. эстетическая привлекательность
5. component testing	e. автомастерская; ремонтная база
6. laser thermometer	f. пневматический инструмент
7. AC (air conditioning)	g. переносная батарея
8. video scope	h. установка, настройка; монтаж, сборка; устройство
9. air compressor	i. зажим типа «крокодил»; щипковый зажим
10. pneumatic tool	j. металлообработка, обработка металла
11. finishing	k. профессиональный; специальный
12. aesthetic appeal	l. полировка, полирование
13. installation	m. неподвижное положение
14. portable battery	n. лазерный термометр
15. alligator clip	o. чистовая обработка, отделочная обработка, финишная обработка
16. stationary position	p. тонкий, утончённый; искусный, изящный
17. mechanical workshop	q. программное обеспечение (предоставляет автомобильную техническую информацию для профессионального обслуживания, технического обслуживания и ремонта автомобилей, легких коммерческих автомобилей и мотоциклов)
18. metalworking	r. воздушный компрессор/пульверизатор
19. polishing	s. модернизированный вариант; обновлённая версия
20. delicate	t. система кондиционирования воздуха

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

1. power tool механизированный инструмент, приводной инструмент
2. job-specific tool kit специфический для данной работы набор инструментов
3. brake pad тормозная накладка
4. brake calliper wind back tool kit набор инструментов для утапливания поршней тормозных суппортов
5. calliper's piston поршень суппорта
6. rethreading set набор для повторного нарезания повреждённой резьбы
7. oil pan поддон картера
8. radiator pressure tester прибор для определения давления в системе охлаждения
9. leakage утечка; течь; негерметичность; просачивание; протекание
10. gauge контрольно-измерительный прибор; датчик
11. sustained устойчивый; поддерживаемый; постоянный
12. coolant circuit контур охладителя, контур теплоносителя
13. head gasket прокладка головки блока цилиндров
14. wiring diagram схема электрооборудования
15. timing belt ремень привода газораспределительного механизма
16. torque value усилие затяжки
17. overheat перегрев; перегреваться
18. circuit контур; схема; цепь
19. hard-to-reach труднодоступный
20. car repair shop станция технического обслуживания; автомастерская
21. maintenance техническое обслуживание и текущий ремонт
22. application использование, практическое применение; работа
23. line направление, занятие, род деятельности
24. impurity-free без примесей; очищенный от посторонних предметов
25. compressed air сжатый воздух
26. lightweight легковесный; облегчённый; лёгкий
27. tire inflation накачивание шин; подкачка шин
28. wear-and-tear износ; изнашивание; амортизация
29. high-pressure washing промывка высоким давлением
30. effortless не требующий усилий; лёгкий; непринуждённый
31. engine block блок цилиндров (двигателя)
32. jump starter пускозарядное устройство
33. machinist vise слесарные тиски
34. jaw губка (тисков)
35. screw зажимной винт
36. lever поворотная рукоятка
37. underhood LED light bar подкапотная светодиодная балка/лайтбар
38. lighting equipment осветительное оборудование
39. wrapping нанесение защитного слоя
40. respraying повторное нанесение (краски)
41. painting окраска, окрашивание
42. film плёнка
43. sharp blade острое лезвие
44. squeegee скребок с резиновой насадкой; резиновый валик
45. heat gun аппарат для сушки струёй горячего воздуха
46. coating покрытие
47. paintwork окрашенная поверхность

48. corded с проводом; со шнуром
49. cordless беспроводный; с батарейным питанием
50. confined ограниченный; узкий
51. fatigue усталость, утомление
52. rotary tool фреза
53. grinding шлифование; шлифовка
54. sanding очистка песком; пескоструйная очистка
55. engraving гравирование, гравировка
56. interchangeable заменяемый, сменный
57. buffing полирование кожаным или матерчатым кругом; предварительное полирование; полировка, шлифовка; зачистка
58. ding вмятина
59. car body кузов легкового автомобиля
60. grinder шлифовальный станок
61. spinning вращающийся, крутящийся
62. rusty ржавый; проржавевший
63. full-sized полноразмерный
64. handy удобный (для пользования); полезный; легко управляемый
65. angle grinder ручная машина для шлифования под углом
66. power drill электрическая дрель
67. versatile многофункциональный; широкого назначения; универсальный
68. welder сварочный аппарат
69. MIG welder дуговая сварка металлическим электродом в среде инертного газа
70. TIG welder установка для сварки вольфрамовым электродом в среде инертного газа
71. jigsaw сабельная пила, электролобзик
72. in straight lines прямолинейно; по прямой
73. curve кривая; изгиб; дуга; закругление
74. thickness толщина
75. density плотность; удельный вес
76. DIY (do it yourself) «сделай сам»
77. buffer полировальная шлифмашина
78. waxing полировка восковой пастой
79. air tool пневматический инструмент
80. tire inflator with gauge насос для подкачки шин с датчиком
81. tire pressure внутреннее давление в шине; давление воздуха в шине
82. PSI (pound-force per square inch) фунт-сила на квадратный дюйм – единица давления: 1 psi = 6895 Па.
83. impact wrench пневматический ключ с ударным воздействием, гаечный ключ ударного действия
84. high-torque высокомоментный; с большим крутящим моментом
85. lug nut нестандартная гайка крепления колеса
86. wheel lug гайка/болт колеса
87. portability возможность переноса; компактность; портативность; мобильность
88. impact socket ударная головка
89. female torx set звездообразный ключ с разъемом типа «мама» (внутренний квадрат)
90. measurement измерение; измерительный

91. digital calliper цифровой штангенциркуль
92. engine component узел двигателя, деталь двигателя
93. fraction дробь
94. inch дюйм – единица длины = 1/12 фута; = 2,54 см
95. high accuracy с высокой степенью точности

Exercise 5. Read and translate the text about specialized tools using word-lists from Ex. 1-4.

Text 1. Advanced Tools

Information sources: <https://gear4wheels.com/auto-mechanic-tools-list/>,
<https://www.mechanicsscout.com/power-tools/>, <https://ronixtools.com/en/blog/essential-cordless-tools-for-mechanics/>,
<https://www.atlascopco.com/en-ae/compressors/air-compressor-blog/automotive-air-compressor-for-car-workshop>,
<https://www.toolstop.co.uk/blog/knowledge-base/how-to-use-a-jump-starter>,
<https://engineeringlearn.com/types-of-vices-and-their-applications/>

There are some professional tools for auto repair shops that you need for the most serious jobs. The following selection comprises power tools, upgrades and some very job-specific tool kits that allow you to conduct every job ever possible on a car.

Category: Hand Tools

If you want to change discs and brake pads, you need a *brake calliper wind back tool kit*. This tool lets you wind the calliper's piston back so that you gain some space to mount the newer, thicker pads and discs. A *rethreading set* can help to rethread the hole of an oil pan or you may need it when plugs are stripped.

Category: Diagnosis and Troubleshooting Tools

A *radiator pressure tester (kit)* allows easy testing for leakage in radiator system and quick change of coolant. By pressurizing the system and being able to control it via the gauge, we can check the sustained pressure and diagnose a failing coolant circuit. A *cylinder compression tester* allows you to conduct a quick check of cylinder compression to spot head gasket failures and other problems. Simply remove all spark plugs, plug the gauge on one of the holes and turn the key to try and start the car. The gauge will show you the pressure inside the cylinder. *Autodata* is software that contains technical information on over 40,000 different vehicles. From wiring diagrams, timing belt diagrams, torque values for parts, to component testing, etc. This is the ultimate tool for professionals. A *laser thermometer* is generally used to troubleshoot refrigerator circuits. Also, it's very useful for diagnosing AC systems and cars that overheat, as you can follow the circuit and check where the temperatures aren't right. A *wi-fi video scope* has cameras and helps you to see directly on your phone what's going on in the most hard-to-reach areas, for instance, inside the cylinders.

Category: Garage Tools

Car repair shops use *air compressors* to carry out maintenance and other applications depending on the line of their work. But generally, dry, impurity-free, compressed air is required for different purposes. It's needed to work with the pneumatic tools which are nowadays preferred more than electrical tools because they are easy to operate and lightweight. Compressed air is used for tire inflation to avoid wear-and-tear and for high-pressure washing and cleaning to get the task done in an effortless manner. Compressed air systems give power when it's necessary to wash a car or remove the dust from hard-to-

rich parts like an engine block, etc. The air compressor is also used for car painting and finishing giving the vehicle a high-quality aesthetic appeal. A *jump starter* is a life saver in many cases. Batteries always run down at the wrong moment, for example, when you are testing audio installations. The jump starter is a portable battery device that allows you to jump start a vehicle. It outputs a large amount of power in a short period of time, sending a very strong impulse via the alligator clips to kick-start a dead car battery. A *machinist vise* is an extra pair of super strong arms you miss when you work solo on your car. It's a simple and powerful mechanical apparatus that holds an object rigid at a stationary position so that you can perform work on it. Vices consist of two corresponding jaws; one is static and the other can be moved in and out by a screw and a lever. It's used in a mechanical workshop, metalworking, etc.

Category: Lightning

Underhood LED light bars are a lighting equipment you need when you conduct complex jobs on the engine.

Category: Power Tools

Have you ever heard of wrapping a car? No, it isn't for preparing a gift. It means to protect the car's paint and to give a new look to your vehicle without respraying it. This method is an alternative for complicated and more expensive painting. All you need is a prepared and clean car, a vinyl film, a sharp blade, a squeegee, and a proper *heat gun*. A powerful heat gun is applied to heat a layer of plastic vinyl coating and make it stuck over the top of the vehicle's paintwork. In vehicle wrapping centers corded heat guns are used more often than cordless ones because vehicle wrapping is a long process and a battery may run down soon. But for confined and small spaces, a cordless heat gun is a must. Besides, cordless heat guns are lighter and easier to carry around, so you can work for hours without fatigue. *Rotary tool kits* offer a wide range of uses; they can be used for grinding, sanding, polishing, and even engraving. They typically come with a number of interchangeable heads, so you can also perform a lot of smaller and more delicate jobs, such as polishing, cutting things, cleaning hard-to-get areas, buffing out small dings in the car body. A *grinder* is a power tool with a spinning part that can be used for all kinds of grinding including rusty metal surfaces, cutting and polishing. Different types provide various uses. A full-sized grinder is really handy. But if you want the one that can be easily stored or carried around, you should buy a compact angle grinder. It's small but powerful. A *power drill* is useful for working on vehicles and around your home. It's a versatile tool that can be used for anything from making holes to driving in screws. There are full-sized and compact options. As it's a popular tool, it's easy to find an affordable one. However, if you want a drill that's going to last for a long time, it's worth investing in something a bit more expensive. A *welder* helps you to join metal together. If you do a lot of auto work, it can come in handy. MIG welders are the type that's most preferred by beginners and amateurs. They run on electricity and are suitable for use on steel and aluminium. TIG welders are more professional. More powerful welders allow you to weld thicker metal. A *jigsaw* cuts metal and other materials in both straight lines and along curves to get different shapes and sizes. Different blades are applied depending on the material, its thickness, density, and size. There are cordless options. Jigsaws can be also used for doing various types of DIY at home. A *buffer* is a great tool for polishing, if you want to give your vehicle the high shine. Buffing can give you the same effect as waxing, but when you have a buffer, you can take care of the job quickly and easily, with no mess. Buy a cordless buffer. It's more convenient to work with.

Category: Air Tools

A *tire inflator with a gauge* is an air compressed tool. Buy it as soon as you get a compressor. It allows having a tire pressure always spot on. Buy one with a gauge that reads at least up to 8 bar or 100 PSI. An *impact wrench* can be found in every automobile repair shop. For any high-torque situations, you need a proper impact wrench and a set of sockets. Its most useful feature is loosening lug nuts from cars and trucks. A conventional impact wrench can accommodate a 1/2-inch socket of various sizes that can fit a wheel lug. In the past, the pneumatic-powered impact wrenches were the most commonly used tools in professional garages. But as battery technology improved, the cordless impact wrenches became a viable alternative to the pneumatic types due to their portability. *Impact sockets* as opposed to regular sockets are made for use on air compressed tools. Buy a set with sockets from 10mm to 32mm. A *female torx set* is useful because there are some car manufacturers that use torx headed bolts frequently. If you deal with a Mercedes, for instance, you need the set for almost everything.

Category: Measurement Tools

A good *digital calliper* is an essential tool when we conduct performance jobs on engines. It's much easier to measure engine components with a digital calliper than a classic one. Buy a calliper that reads fractions, inches and mm and has a very high accuracy.

Exercise 6. Match the tools from Text 1 to the appropriate jobs you may do with them.

1. a brake calliper wind back tool	a. testing for leakage in radiator system and quick change of coolant
2. an air compressor	b. stripping plugs, rethreading the hole of an oil pan
3. a rethreading set	c. jump starting a vehicle
4. a radiator pressure tester	d. checking cylinder compression
5. a jump starter	e. changing discs and brakepads
6. a machinist vise	f. working with pneumatic tools; tire inflation; high-pressure washing and cleaning; car painting
7. a wi-fi video scope	g. providing good light while working under the hood
8. a cylinder compression	h. grinding down rusty metal, cutting and polishing
9. a rotary tool	i. making holes, driving in screws
10. an underhood LED light bar	j. cutting metal into different shapes and sizes
11. a grinder	k. controlling the tire pressure
12. a buffer	l. loosening and tightening of suspension bolts and head bolts, especially on a Mercedes
13. an impact wrench	m. checking the temperature is right, diagnosing air conditioning systems
14. a power drill	n. polishing
15. a female torx set	o. checking hard-to-reach areas and places in cars
16. a jigsaw	p. joining metal together
17. a digital calliper	q. grinding, sanding, polishing, engraving, buffing, cleaning, and cutting
18. a tire inflator with gauge	r. loosening lug nuts, removing wheel bolts, performing any heavy-duty jobs in suspension, steering and engine
19. a laser thermometer	s. dealing with different jobs in the mechanical workshop or car repair shop when securing an object is needed

20. a welder	t. measuring engine components
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Exercise 7. Look through Text 1 again and make a list of advanced tools. Say a few words about each of them.

Exercise 8. Work in pairs. Read and translate the dialogue between two mechanics. Act it out. Then, make your own dialogues.

A: Hello, Vlad! Have you seen my new cordless rotary tool?

B: Hi, Artyom! No, I haven't. When did you buy it?

A: Last week. I booked it in the online automobile repair shop. I've tried it already! It's super handy and efficient for many different tasks!

B: Really? What exactly have you used it for?

A: If I tell you, you'll laugh. Well, I started with removing battery corrosion! It was perfect! In the past I had to use a toothbrush for that! And then I cut a rusted clamp. And, finally, I buffed a scratch off my motorcycle!!! The tool was really great! It has performed very well!

B: No kidding? It must have been very hard!

A: Not really. I cleaned the dirt first and smoothed out the scratch with a rubbing compound using the felt wheel in a circular motion. After the compound got dried, I removed it with a soft microfiber cloth, and then applied the polishing compound. And look at my motorcycle! I achieved a very-first-look back on it!

B: Fine! It's really fantastic! And was it convenient to work with the cordless rotary tool?

A: Yeah. In fact, I had more control and could work in different positions without the wire coming in the middle!

B: I see. That's good to know. Can you send me a link? I want to get more details about this rotary tool.

A: Yes, sure.

Exercise 9. Search the Web for a list of tools for an auto repair shop and make a presentation about it.

Exercise 10. Look through Unit 9 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. personnel 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 ____ you? I have studied ____ 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, <u>Position:</u> assistant accountant in a medium-sized firm. <u>Skills:</u> 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 <u>Position:</u> community Services volunteer, personal care assistant. <u>Skills:</u> 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 <u>Position:</u> 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. <u>Skills:</u> 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. Consult the sample (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 (ана- лиз/ 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/ em- ploying 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/ наблю- дать за работой (за деятельностью кого-либо)	to supervise (the work of 30 operating employ- ees/ 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 рабо- чем 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 effi-

ciently, 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?	I had to change my job because... there wasn't inner freedom, the salary was...
Why did you leave the company for which you worked so long?	the working hours were... the journey to work was...

Why did you leave your job? What didn't you like in your job?	the job was too... my responsibilities were too... I was responsible for too many...
Did your job become too boring, too monotonous?	I wasn't earning a good... the money wasn't good enough. I didn't have enough time.
Were there any prospects of promotion in the company you worked for?	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	I went to two secondary schools from ... to I attended ... from ... to... . I took my school-leaving exams in I 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.

you finished school?	
What about your further education?	For 5 years, from ... to I was at university/ at college in
Did you go to university?	I specialized in ...
What subjects did you specialize in?	My major at university was
What was your major at university?	I was an economics major.
Did you get a university degree?	My studies at... led to a Bachelor's/Master's degree in
Did your studies at university lead to a degree?	I got my specialization diploma in ...
Did you graduate with honours?	Yes, I did. I was good at most subjects.
Did you get a distinction diploma?	I graduated from ...with...
Work Experience, Abilities And Skills	
Have you ever got a job?	I got a job as a ... for ... company.
When exactly was that?	I worked there for ... years.
When did you start work?	I worked for ... years with a company in
What posts did you hold?	I held two posts there.
When were you promoted to this position?	I held a key management position in ... company. I was promoted to this position/ to this department in ...
What companies have you worked for?	I have worked for .../with... .
Have you ever worked with a volunteer organization?	
What jobs did you apply for, when you came to ...?	When I came to ... I started work for... company.
What department did you work in?	
What skills did you acquire while working for/ with ... company?	I acted as ... when he/ she was on vacation, carried out several... projects, was responsible for ..., took part in...
What were your professional responsibilities and duties?	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?	I don't think I am very skilled in ... but I am hard-working.
Are you good at dealing with difficult people?	When I worked for ... company, I was involved in a number of projects which required management skills.
Do you have the skill to cope with a difficult job?	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/
Have you ever been involved in managerial functions?	
Do you have any managerial skills?	
Are you good at delegating responsibilities to subordinates?	

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/ at the university.
What languages do you speak?	I am fairly fluent in
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 the 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. Consult the sample letter.

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 de-

velop 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 dialectical 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. Auto Repair Shop Equipment

Text 1. Workshop Equipment: Vehicle Hoists

Sources: <https://autoedu.info/en/equipment-and-tools/workshop-equipment/>,
<https://autoedu.info/en/equipment-and-tools/workshop-equipment/vehicle-hoists/>

Before starting the process of servicing the vehicle, it is necessary to create conditions that will ensure uninterrupted and safe operation. For that, we use workshop equipment that is indispensable in every service. Workshop equipment is used to help with work, vehicle protection, environmental protection, and personal protection and safety.

Much of the workshop equipment is legally required and is often subject to periodic inspections for safety reasons. Therefore, it is necessary to inspect the equipment well before each use and to apply and use it as prescribed.

Vehicle hoists raise the whole off the ground so that technicians can easily work on the underside of the vehicle. When the vehicle is hoisted, technicians do not have to bend down or lie down during operation.

Vehicle hoists have several different designs. Come in a range of sizes and configurations to meet the particular needs of the workshop. The most common types of vehicle hoists in general use are single-post, two-post, and four-post hoists. Other types of hoists include scissor lifts, parallelogram lifts, and mobile or specialty lifts. The in-ground hoist is very compact and leaves free space around the vehicle but blocks access to the center under the vehicle.



Single-post hoist, scissor and parallelogram lift

Each vehicle hoist should have a mechanical locking device so that the vehicle hoist is secured at the desired height. This locking device prevents accidental lowering of the vehicle and keeps the vehicle in place even if the lifting mechanism fails. Never walk under a raised vehicle until the safety locking mechanism is activated.

Vehicle hoists are dimensioned for a specific weight and vehicle type and must never be used for purposes other than those recommended by the manufacturer. In particular, a vehicle that is heavier than the specified maximum capacity of the hoist should never be lifted. In most countries, some regulations require periodic inspection of the crane (usually for one year) and obtaining a certificate of use. Before using the hoist, it is necessary to check its load-bearing capacity and the validity of the use permit (certificate) on the plate.

Also, before lifting, check that the vehicle body is undamaged and compact. Damage, rust or any repairs to the bodywork during lifting can damage the vehicle and even be dangerous to you.

Check that the vehicles are too high or that they have roof racks, which can lead to damage to the roof structure during lifting.

Lift the vehicle with a crane to the appropriate work height. Lock the hoist before working under the vehicle.

Two-post hoists are most often used in car workshops. We have two types – symmetrical and asymmetrical. Symmetrical two-post hoists have paws of equal length so that the vehicle is placed symmetrically between the posts. This positioning places the pillars in the direction of the vehicle's front doors, which makes it difficult to get in and out of the vehicle. Asymmetrical hoists have shorter arms in front of the posts than in the rear of the posts. This allows the vehicle to be positioned farther back on the hoist, allowing better access to the doors on the vehicle. Both types of two-post hoists allow technicians easy access to the lower part of the vehicle and the ability to remove wheels while the vehicle is raised.



Two-post hoist

Two-post hoists require careful positioning of the hoist arms so that they are below the appropriate lifting points on each side of the vehicle so that the weight of the vehicle is evenly distributed. The service information for the vehicle details where those lifting points are so that the vehicle can be raised without causing structural damage. Check if rubber pads are needed to protect the vehicle.

Using a four-post hoist is very easy. The vehicle was imported on two narrow wheel platforms, one on each side of the vehicle. The platforms are then raised, taking the vehicle with them. The underside of the vehicle is accessible to the technician. However, the wheels cannot be removed because the vehicle relies on hoist platforms over them. Another type of hoist must be used to remove the wheels from the vehicle.



Four-Post Hoist

Text 2. Jacks

Source: <https://autoedu.info/en/equipment-and-tools/workshop-equipment/jacks/>

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. These cranes must not be used to support the vehicle when intervening under the vehicle. They are only used to lift the vehicle so that the vehicle is then carefully lowered onto the appropriate jack stands.

There are three main types of jacks: hydraulic, pneumatic, and mechanical. In hydraulic jacks, pressurized oil acts on the piston to lift. Pneumatic jacks use compressed air for lifting the vehicle. In the case of mechanical jacks, screws or gears are used to create the mechanical lever required for lifting.

Each jack must always be used for its intended purpose and by the manufacturer's instructions. Regular inspections should be performed to ensure their safety in use.

Always use the appropriate type of jack and pay attention to the maximum load capacity.

According to the purpose and shape, there are several types of jacks.

Floor jacks are unavoidable hydraulic cranes in every car workshop. They are mounted on four wheels, two of which are movable so that they can be more easily positioned for lifting. They have a long lever that is used to control and create hydraulic pressure in the lifting mechanism. Floor jacks are low and suitable to position under the vehicle.

Bottle jacks are portable jack that usually has a hydraulic drive. They have a handle through which the hydraulic pressure is created, which raises the lever with the stand vertically from the center.

Air jacks use compressed air to inflate the air bags. They are used as an alternative to floor jacks. The air bags are placed on a mobile platform with a long handle. They have a quick-connect fitting for compressed air. They inflate the air under pressure with rubber bags and lift the vehicle over the stand at the top.



Floor jack



Bottle jack



Air jack

Scissor jacks are the most common type of mechanical jack that is an integral part of the equipment of a wheel replacement vehicle. Used to jack one vehicle wheel. A screw is screwed over the handle, which acts on the lifting levers in the form of scissors.



Scissor jack



Transmission jack



Engine hoists

A special type of jack is used to lower and raise the transmission. This jack is mounted on a wheeled stand and has a specially adapted surface at the top for secure transmission support. They are usually hydraulically driven but can also be powered by compressed air.

Engine hoist is specially made for pulling out, carrying and placing the engine on the chassis of the vehicle. These hoists have a hydraulic drive, which lifts the engine via an arm, chain and hook. The crane is mounted on wheels, which easily and safely transports the engine to the storage location.

Text 3. Jack Stands and Wheel Chocks

Source: <https://autoedu.info/en/equipment-and-tools/workshop-equipment/jack-stands-and-wheel-chocks/>

Jack stands are adjustable supports that are used to hold the vehicle after it has been lifted by a hoist. They are structurally designed to withstand the weight of the vehicle. Jack stands are height-adjustable and mechanically locked at the selected height. This makes them very dependable if used properly.

Before mounting, select a safe place on the vehicle body where you will support it. The jack stand is placed on a flat ground surface because it can tip over, causing the vehicle to slip off. The appropriate height of the stand is adjusted and then locked. If properly installed and adjusted, the vehicle is carefully lowered onto the carrier stand and the jack can be moved.

Jack stand provides a stable grip on the raised vehicle and is much safer than the jack because they cannot be lowered accidentally. To lower a vehicle that is on jack stands, it is necessary to raise it again with a jack to remove the jack stands.



Jack stands

Each jack stand has its load rated and should not be used for heavier weights. Before use, check the condition of the stand. If cracked or bent, they are not safe to support the vehicle. Always use matched pairs of jack stands.

Only use jack stands for supporting the raised vehicle. Do not use wood or steel blocks that may slide or split under the weight of the vehicle. Do not use bricks or concrete blocks to support the vehicle they may crumble under its weight.

When the vehicle is lifted on one side only, the use of wheel chocks that are not lifted is mandatory. These chocks have a special wedge shape and can be easily inserted under the rubber wheel. Wheel chocks block the movement of the wheels and thus the vehicles.



Wheel chocks

Chocks can be made of plastic, rubber and metal. It is recommended that the chocks be placed on both sides of the point that does not rise from the ground. There is a variant with two chocks on the stand for one wheel. One, the end chock is inserted into the wheel and the other on the opposite side is moved and locked on the other side of the wheel.

Text 4. Engine Stands

Source: <https://autoedu.info/en/equipment-and-tools/workshop-equipment/engine-stands/>

The engine support bar is used to hold the engine in place during removal from the vehicle. Placed on the inner part of the wing with rubber supports and the engine is covered with a chain or hook. When the engine is released, the support bar keeps the engine hanging and it is safe to perform work under the vehicle. With some, the angle of the support bar can be adjusted and the motor can be lowered and raised via the bolts that support the chains.



Engine support bar

After removing the engine from the vehicle chassis, use an engine hoist to lift and move the engine. The engine can be stored on the workshop floor or mounted on the engine stand.

The engine stand is useful equipment in the workshop. They are a convenient device to support an engine when it is out of the vehicle and being worked on. Engine stands come in a variety of ratings. Should be used for engines of the intended size and weight.

The stand shall have a plate or arms on which the engine is mounted with at least four bolts of adequate strength. For safety, ensure that they thread into the hole at least six complete turns.

The engine stand plate in the extension has a roller head that is inserted into the base of the stand so that the engine can be rotated. The engine should be placed on the plate/arms so that its center of gravity is in the middle of the plate, i.e., the head of the stand. Otherwise, overturning the engine at one end can cause it to turn sharply and injure you.



Engine stand

The stands have a brake (screw or lever) that ensures that the engine is stationary in the appropriate position, which allows easy and safe access.

Text 5. Bench Vice and Bench Grinder

Sources: <https://autoedu.info/en/equipment-and-tools/workshop-equipment/bench-vice/>, <https://autoedu.info/en/equipment-and-tools/workshop-equipment/bench-grinder/>

A vice is used for gripping and holding a workpiece in position for carrying out its various bench working operations, such as cutting, filing, bending, chiseling, etc.



Bench Vice



Bench grinder

The objects are accepted between two parallel jaws, one of which is fixed, and the other is moved by turning the clamping screw. The vice base is fastened to the work table with screws. The vice can have a fixed or swivel base. The turntable allows the vice to rotate, providing easier access to the clamped material during operation.

The receiving surface of jaws is serrated, which provides a stronger grip. The jaw is extremely strong and can damage softer materials when tightened. To prevent such damage, a pair of softer jaws made of aluminum, copper, brass or rubber are mounted.

A bench grinder is an electrical device that is attached to a work surface. The grinder should have protective shields. When using it is necessary to use face protection.

Bench grinders are classified according to the size of the discs. Disks from 150 to 250 mm (6-10 inches) are most often used in car workshops. Do not attempt to set the sanding disc larger or smaller than intended.

According to the purpose, three different types of the disk are used:

- Abrasive disc, used for various grinding jobs, sharpening tools, cutting or removing, trimming the edge after cutting. They are classified according to the size of the abrasive grain, from coarse to very fine;
- Wire disc, used for cleaning and polishing, removal of rust, scale and paint, removal of sharp edges after cutting and the like
- Polishing disc, intended for grinding and polishing.

Text 6. Ultrasonic Bath

Source: <https://autoedu.info/en/equipment-and-tools/workshop-equipment/ultrasonic-bath/>

An ultrasonic bath is an economical and environmentally friendly device for washing and cleaning vehicle parts. For washing, a liquid is used through which ultrasonic waves propagate. With the passage of ultrasonic waves, there is an alternating stretching and contraction of fluids.

Due to the intense vibrations of the liquid, small vacuum bubbles are created, creating a micro pressure of 650 bar. When the object we want to clean is immersed in an ultrasonic bath, millions of micro-bubbles reach the tiniest cavity and under enormous pressure act on the dirt particles, erupting them from the surface of the object.

A solution of water and a suitable degreasing agent is used to wash the parts. Plain or demineralized water can be used. Demineralized water is more efficient in the washing process.



Ultrasonic bath

For the proper use of an ultrasonic bath, it is necessary to adhere to certain recommendations:

- Do not switch on the appliance without liquid as it leads to overheating.
- Do not switch on the heater without water.

- The minimum amount of liquid in the bath is 2/3 of the container.
- Do not place washing items on the bottom of the bath, but on suitable supports.
- Do not remove objects from the bathtub while the ultrasonic generator is running.
- The maximum operating time of the ultrasonic bath is 30 minutes.
- Take a break of 10 minutes between two consecutive washes.
- The liquid changes only when it gets dirty. Wait for the dirt to settle, pour the liquid into a clean container, remove the sediment and return the liquid to the bath and top up if necessary.

Text 7. Ultrasonic Bath: Instruction

Source: <https://autoedu.info/en/equipment-and-tools/workshop-equipment/ultrasonic-bath/>

For efficient washing, it is necessary to perform a preparation that consists of pouring/adding water, heating, forming a washing mixture, degassing, finding the node by correcting the height of the liquid in the bath.

To prepare ultrasonic bath for washing, first, pour clean water or prepared washing mixture to the maximum height, separated by a hem on the inside of the bath. Then the heating is switched on by setting the thermostat to a temperature between 30 and 40 °C. When the thermostat control lamp is switched off, the heater is switched off and the mixture is formed by pouring the appropriate concentrated washing liquid.

After the mixture is formed, degassing of the liquid is performed by turning on ultrasound. Degassing expels air bubbles from the liquid, which negatively affects the propagation of ultrasonic waves and the washing process. This phase lasts up to 10 minutes.

Finally, the ultrasound bath node is determined. From the bottom of the bath, longitudinal waves are emitted, which intersect at every 2-3 cm of height, creating the maximum cleaning effect. Determination of the node, i.e., the required fluid level is performed during the ultrasound operation by removing and adding fluid until the greatest visual effect of boiling fluid is observed on the surface. Determining the node completes the preparation of the ultrasonic bath.



'Boiling' of liquid in the bath



Washing the injector in the ultrasonic bath

Before washing, depending on the item, a wire mesh or part carrier is placed on the bath. Do not place the washbasins on the bottom of the bathtub, as vibrations can damage the bathtub. Washing parts are placed on the net or carrier and include ultrasound. The optimal time for washing and cleaning parts is from 20 to 30 minutes. While the ultrasound is on, no parts are inserted or removed from the bath.

After the scheduled washing time, the ultrasound is turned off and the parts are removed from the bathtub. It is recommended that after ultrasonic washing and extraction from the bathtub, the parts be washed with water to stop the chemical reaction of washing.

The next wash cycle is done after a break of 5 to 10 minutes. If a new wash is not planned, the ultrasonic bath is closed with a lid. When the precipitate has accumulated, the liquid is poured into a clean container and the precipitate is removed from the bath. The separated liquid can be used again for washing.

To wash parts in an ultrasonic bath, follow these steps:

1. Washing preparation: Pour the liquid into the bath to the appropriate height. Turn on the heater and set the thermostat to 30-40° C.

After heating the liquid, turn off the heater and form a washing mixture by adding the appropriate liquid.



Turn on the ultrasound and allow 10 minutes to perform degassing. Then, by adjusting the level of the liquid, determine the level where the knot of ultrasonic waves is.

2. Washing: Place a wire mesh or part carrier on the ultrasonic bath. Place the washing parts on the net or bracket. Include ultrasound.

After 20-30 min turns off the ultrasound. Remove the washed parts from the bath. Take a break for 5-10 minutes before washing again.



After washing, cover the bath or, after settling the sediment, remove the liquid and remove the sediment from the bottom of the ultrasonic bath.

3.2. Vehicle Technical Maintenance

Text 1. Engine Mechanical Testing

Source: <https://autoedu.info/en/auto-mechanic/engine/engine-mechanical-testing/>

Engine mechanical testing is a series of tests to assess engine conditions. First, tests have been performed that cover the entire engine, and then, with the elimination system, we narrow the scope of the test until a malfunction is detected, which is the cause of poor engine operation. The test begins with a visual inspection for leaks that can reveal worn seals and gaskets on the engine. An engine sound test is then performed during start-up and operation where irregularities due to a change in sound can be observed. After that, the engine is tested using tools and measuring equipment for more precise condition diagnostics and fault detection.

The engine runs stably and efficiently only if the mechanical condition of the engine is good. All engine components must be in good condition and seal well. If elements such as pistons, piston rings, cylinder walls, valves and head gaskets do not seal, the engine is malfunctioning.

Engine instability can be caused by a system mismatch and only additional adjustment is sufficient to improve engine performance. But often additional settings cannot stabilize the operation of the engine because the cause is poor sealing of some components. When the valve burns out the valve adjustment alone cannot fix the poor operation but must be replaced. Therefore, when the engine is malfunctioning, it is necessary to perform an engine operation test to determine the cause of the malfunction.

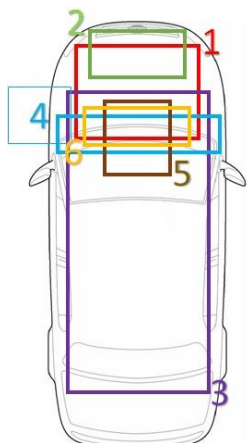
Text 2. Engine Compartment Inspection for Fluid Leakage

Source: <https://autoedu.info/en/auto-mechanic/engine/engine-mechanical-testing/fluid-leakage/>

Engine compartment inspection for fluid leakage is performed during each periodic inspection or servicing. When a client complains that he has noticed fluid on the engine or under the vehicle and finds a lower fluid level, an emergency inspection is performed for fluid leakage.

The color of the liquid is the best indicator of which system is leaking. Engine and transmission oils are black, coolants are orange or green, and power steering oil is red. The smell of liquids can also indicate the type of liquid. Fuel and coolant have different odors.

When you follow the trace of a leak, you should know that gravity causes the liquid to go down, and the radiator fan and the movement of the vehicle push the liquid in the direction of the air movement.



Fluid							
Location	1	2	3	4	5	3	6
Color	Brown to black	Green or yellow	Clear or yellow to brown	Pink or red to brown	Pink or red to brown	Clear	Blue or green
Feel	 Oily (Thick-slippery)	 Slimy	 Oily (very slippery)	 Oily (thin)	 Oily (thin)	 Thin-watery	 Thin-watery
Smell	 Cooking oil	 Sweet	 Fish oil	 Burnt marshmallow	 Petroleum	 Gasoline	 Glass cleaner

Identification of fluid leaks on the vehicle

Often, due to dirt and inaccessibility, the place of liquid leakage cannot be detected. Then certain measures must be applied in the process of detecting leak sources. Sometimes it is necessary to wash the engine under pressure using a degreasing agent to facilitate the search.

The inspection for fluid leakage should be thorough and well planned. During visual inspection, use a strong light source and a mirror for inaccessible places. Sometimes it is necessary to remove the protective covers and heat shields from the engine. Some leaks can only be seen when the engine is running, and some only when it is not running. Precautions are required when searching for moving parts when the engine is running. For some leaks, it is necessary to use fluorescent paints. When there are small leaks, after washing the engine or applying fluorescent paint, the client must drive the vehicle for several days for the liquid to leak.

Sometimes you can only detect a leak by inspecting under the hood, and sometimes you need to inspect under the vehicle. Therefore, the search for liquid leaks can be divided into an inspection under the hood and an inspection under the vehicle.

To inspect for a leak under the hood, follow these steps:

1. Vehicle preparation: Ensure the vehicle for safe operation. Lift the hood cover and make sure it is secure. Remove all masks and elements that you think would interfere with the engine compartment for leaks.

2. Checking the cooling system for leaks: Check the radiator, radiator hoses, water pump, control valve, all connections, and hose manifolds.

3. Engine oil leak test: Check for oil leaks on the engine, oil cap, intake manifold, camshaft oil seal, and all other engine oil seals and gaskets.

4. Fuel leak test: Check for fuel leaks at the fuel supply and return lines, fuel filter connections, common rail, pressure regulator, injectors, and all other components in the fuel supply system located in the engine compartment under the hood.

5. Checking leakage power steering system: Check oil leaks on the power steering pump, oil tank, supply and return lines, and on the steering rack control box.

6. Checking for leaks in the brake system: Check for leaks on the brake fluid reservoir, brake hoses, connections, and on the rear brake master cylinder oil seal.

To inspect for fluid leaks under the vehicle, follow these steps:

1. Lifting the vehicle: Raise the vehicle in a safe manner and to a height that allows normal viewing under the vehicle. Remove the protective cover under the engine.

2. Checking the cooling system for leaks: Check for coolant leaks on the radiator, water pump, and engine block.

3. Check engine leak: Check for engine oil leaks on the engine block, crankcase, oil drain plug, oil filter, oil pressure switch, crankshaft oil seals, and other joints and seals on the engine.

4. Fuel leak test: Check for fuel leaks at the fuel supply hoses and connections, the fuel filter, and the engine block.

5. Check for leaks on the rack: Inspect the power steering pump, steering oil hose, rack, and oil leak on control system boxes.

6. Checking for leaks in the gearbox: Check the transmission, front and rear differentials for leaks, if any.

Text 3. Engine Noise Diagnostics

Source: <https://autoedu.info/en/auto-mechanic/engine/engine-mechanical-testing/engine-noise-diagnostics/>

The sound of the engine during starting or operation can reveal the mechanical condition of the engine. If it sounds unusual, engine noise diagnostics are performed. Even the

slightest change in sound is a potential problem, and if it is not detected and removed in time, it can cause a serious engine failure.

Some unusual sounds may be detected during start-up and some during engine operation. Some defects are manifested as increased noise during idling, some only at partial load, and some during acceleration. Therefore, noise diagnostics and the frequency of occurrence in a particular operating mode can help detect and locate faults on the engine. For a more precise location of the noise source, a stethoscope can be used. A stethoscope can be standard or electronic.



Standard and electronic stethoscope

Poor engine cylinder compression: When the compression is uniform in all cylinders, a uniform rhythmic engine start sound is obtained during starting. During compression, the piston slows down and lowers the speed of the starter and the motor. This achieves even deceleration and acceleration of the engine, which creates a rhythmic starting sound. If the compression is not the same in each cylinder, it creates an uneven engine start sound. When this malfunction is suspected, it is necessary to prevent the engine from starting by switching off the fuel pump (by removing the fuse or pump relay) and analyzing the obtained starting sound during a longer engine start.

Detonation: Detonation can cause serious engine damage. This condition occurs as a knock or click and is most often attributed to an inadequate ignition angle, improper air/fuel ratio, and poor or inadequate octane value fuel. Detonation can be prevented by reducing the ignition angle, increasing the octane fuel level, reducing the charge pressure, or enriching the air/fuel mixture. In modern electronic engine control systems, the system recognizes the detonation using a knock sensor. Reducing the ignition angle prevents further detonation.

Valve noise: Valve and elevator noise usually starts as a click or rattle sound at half the engine speed and disappears at high speeds. The cause is often a large valve clearance or a malfunction of the hydraulic valve lifter. To check the clearance, we place a smaller measuring sheet between the valve stem and the seesaw or lifter. If the noise is reduced, the cause is too much clearance and you need to make the appropriate adjustments. If it does not reduce the noise, the sound may be caused by a worn lift surface or a worn cam. Another thing to consider involves a lifter that moves loosely in its channel and weak springs.

Piston Slap: The slap of the piston is heard as a muffled ringing sound. This condition is caused by the piston swinging back and forth inside the cylinder. The constant pounding of the piston means that the engine needs to be repaired. However, if it only manifests when the engine is cold, then it is probably not serious.

Piston ring noise: The noise of the piston ring is similar to the noise generated by valves and lifters. However, it is most noticeable during acceleration. Piston ring noise is most often caused by poor ring thrust, broken or worn piston rings, or damaged cylinder walls. We determine the correctness of piston rings by removing the spark plugs and pouring one tablespoon of oil into the cylinders. Then, start the engine a few turns to allow the oil to pass past the rings. You can then install the spark plugs and start the engine. If the noise is reduced, the rings are probably the cause of the noise.

Piston pin noise: Piston pin noise is similar to valve noise and often has a single double metal knock. Sometimes is most evident during idling with later ignition. This noise is most often the result of a worn or loose connecting rod, a worn connecting rod bearing, or a lack of oil. You can detect a faulty piston pin by performing a cylinder balance test. This test is performed by briefly switching off the spark plugs one by one during engine operation. A faulty piston pin is detected when the spark plug of that cylinder is turned off. The noise is reduced because there is no ignition of the mixture and no increase in pressure, which creates noise through the pressure of the piston on the worn shaft.

Connecting rod noise: If you hear a light knocking or pounding sound, it can usually come from the connecting rod. This sound is often most obvious when the engine is at a constant speed (does not accelerate or decelerate) and is often caused by a worn connecting rod or crankshaft bearing, a misaligned connecting rod, or a lack of oil. You can detect a faulty connecting rod by performing a cylinder balance test. A faulty connecting rod is detected when the spark plug of the suspect cylinder is switched off. The noise is reduced because it does not transmit the received power through it.

Crankshaft knock: A heavy but blunt metal thump is a typical crankshaft thump. It is loudest when the engine is under load or acceleration. Crankshaft pounding can be diagnosed if attention is paid to a specific type of pounding. Constant, like rumble-like knock, often comes from worn-out crankshaft bearings. Even more, pronounced thumping is attributed to worn rod bearings. A sharp, irregular impact can be from a worn crankshaft thrust bearing.

To perform engine noise diagnostics, follow these steps:

1. **Vehicle preparation:** Secure the vehicle for safe operation. Open the hood cover and make sure it is secure.

2. **Listening during engine start:** Prevent the engine from starting by switching off the fuel pump (newer vehicles) or the ignition system (older vehicles). Start the vehicle and listen to the start sound. After diagnosing the engine sound, activate the fuel pump or ignition system.

3. **Listening during engine operation:** Start the vehicle and listen to the engine operation in different operating modes. Perform listening at idle, at stable partial load, at full load, and fast acceleration.

4. **Locating the noise source with a stethoscope:** When you notice or suspect noise during engine operation, locate the noise source using a stethoscope.

Text 4. Engine Vacuum Testing

Source: <https://autoedu.info/en/auto-mechanic/engine/engine-mechanical-testing/engine-vacuum-testing/>

Engine vacuum testing involves measuring the vacuum of the intake manifold. The test is performed at different engine operating modes. A vacuum gauge (manometer) or an engine tester with a pressure sensor is used to measure the vacuum. The manometer is placed in the part of the suction line between the throttle valve and the engine at the existing connections of the vacuum hose.



An engine tester is used for precise measurement and analysis of the obtained results. The pressure sensor is a very accurate meter. The measured values are displayed graphically on an engine tester oscilloscope. If the trigger monitors the ignition of the first cylinder, then each cylinder of the engine knows the value of a vacuum. In this way, a graph of the suction line vacuum values can be monitored, and how each cylinder functions in vacuum production and maintenance can be assessed.



With a correct engine, the intake pressure at idle should be in the range of 0.6-0.7 bar. If the idling vacuum value constantly fluctuating in the range 0.15-0.3 bar, then the problem is in the ignition or poor closing valves. When idling reads a constant low-value vacuum, then there is a possibility that the valves open late or late ignition. When sudden acceleration in vacuum value falls to 0.7-0.8 bar, and it should be much higher about 0.9 bar, then there is a possibility that the piston sealing rings are worn. In the event that we have the correct values at idle, and that at a constant engine speed of 2500 rpm the value of the vacuum slowly falls, there is a possibility of clogging in the exhaust system.

To perform a vacuum test of the engine with a manometer, follow these steps:

1. Preparing the engine for measurement: Connect the y-line to the suction line. Connect the manometer to the y-line. Make sure the engine is at operating temperature. Start the engine and check that the y-line connections do not draw in false air.
2. Measurement at idle: Allow the engine to idle and measure the vacuum value.

3. Measurement at acceleration: Accelerate the engine abruptly by quickly adding and releasing gas. Record the maximum value of the vacuum.

4. Measurement at a speed of 2500 rpm: Keep the gas stable at 2500 rpm and read the vacuum value. Analyze the obtained results.

To perform a vacuum engine test using an engine tester, follow these steps:

1. Preparing the engine for measurement: Connect the y-line to the suction line. Connect the manometer to the y-line. Make sure the engine is at operating temperature. Start the engine and check that the y-line connections do not draw in false air.

2. Connecting the pressure sensor: Connect the pressure sensor to the y-line of the engine intake line and the engine tester.

3. Connecting trigger pliers: Connect the trigger pliers to the high voltage cable of the first cylinder. Connect the trigger pliers to the other channel of the engine tester. Adjust the oscilloscope to record vacuum graphics.

4. Measurement at idle: Allow the engine to idle and measure the vacuum value. Analyze the obtained results.

5. Measurement at acceleration: Accelerate the engine abruptly by quickly adding and releasing gas. Analyze the obtained results.

6. Measurement at a speed of 2500 rpm: Keep the gas stable at 2500 rpm and read the vacuum value. Analyze the obtained results.

Text 5. Cylinder Power Balance Test

Source: <https://autoedu.info/en/auto-mechanic/engine/engine-mechanical-testing/cylinder-power-balance-test/>

A cylinder power balance test is performed when the vacuum test shows that there is a mechanical problem or when the engine is uneven working. This test checks the general condition of each cylinder.

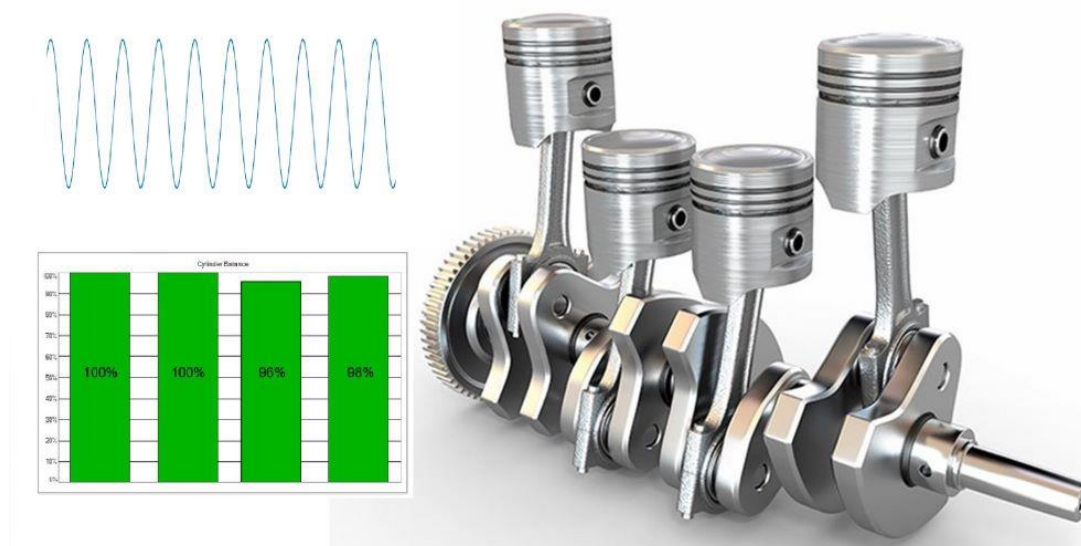
All cylinders should equally contribute to the total power output of the engine. When there is a mechanical, electrical, or fuel supply problem in the engine, the affected cylinders produce less power than others.

The power balance test checks how much each cylinder contributes to the total power output of the engine. The test is performed by disabling the operation of each cylinder individually while measuring the drop in engine speed. A cylinder that has a problem will cause a smaller drop in speed compared to a correct cylinder because it does not contribute enough to working together.

In older vehicles without a catalytic converter, the power balance test is performed by turning off the spark plugs during engine operation while measuring the speed drop. By stopping the ignition on each cylinder, their condition is monitored separately. The ignition is stopped for a maximum of a few seconds. The next spark plug is switched off after the engine has stabilized.

For vehicles with a catalytic converter, ignition neutralization testing is risky. When there is no ignition, the heated mixture goes to the catalyst where there is a danger of self-ignition of the mixture and destruction of the catalyst. Therefore, in these vehicles for the power balance test, the fuel supply is neutralized by disconnecting the injector connector for each cylinder separately.

Newer vehicles electronically control the idle speed. At each deviation from the set speed, the motor ECU corrects the motor operation and establishes the set value. In such vehicles, we cannot measure the drop in speed by neutralizing the cylinder.



Cylinder power balance test

There are two ways to do the testing. The first is to perform the test just above idle, where the ECU does not regulate the variation of the number of revolutions. To set a constant speed above idle, a special tool is used, which is placed between the accelerator pedal and the steering wheel.

The second method is provided by the ECU engine itself, which has a built-in power balance test function. The test is accessed via diagnostics and after activating the ECU automatically switches off each cylinder, measures the speed drop, and analyzes the condition of each cylinder.

So, before taking the power balance test, it is necessary to get acquainted with the vehicle and choose the test method.

To perform a cylinder power balance test, follow these steps:

1. Choosing a test method: By inspecting the engine and vehicle, select the best test method (by stopping the ignition, fuel supply, or automatically via the ECU engine).
2. Preparing for testing: For the selected test method, prepare for disabling the cylinder and measuring the engine speed.
3. Idle measurement: Start the engine and wait for it to reach operating temperature. Measure engine speed at idle.
4. First cylinder power balance test: Disable the first cylinder and read the engine speed. Do not leave the cylinder disabled for more than a few seconds.
5. Activation of the first cylinder: Reactivate the cylinder and let the engine run for approximately 10 seconds to stabilize.
6. Repeat the test steps for all subsequent cylinders: Repeat the steps on each cylinder and read the engine speed. Analyze the obtained measurement results. Determine all necessary actions.

Text 6. Cranking Compression Test

Source: <https://autoedu.info/en/auto-mechanic/engine/engine-mechanical-testing/cranking-compression-test/>

A cranking compression test is performed by placing the measuring hose in the hole for the cylinder spark plug. The compression gauge is connected to the other end of the measuring hose. The gauge reads the air pressure created by the piston in the compression stroke. The read result is compared with the data from the vehicle specification.

Compression measurement means that the engine is cranked over, but not started. For newer vehicles, it is advisable to interrupt the fuel supply by removing the fuel pump fuse or relay. To obtain a correctly measured compression pressure, the engine must be started until at least 5 compression pulses are measured on the pressure gauge. If the measured compression pressure is low, the cause may be on the valve, piston seals, piston, cylinder walls, or cylinder head cover gaskets.



Gasoline engine compression measuring kit



Current clamp for engine tester

Recommendation for measuring engine compression is to keep the engine at operating temperature, to remove all spark plugs, the battery should be fully charged or the starter should be connected, the throttle should be kept fully open and at least five compression pulses should be made on each cylinder (the same number of pulses for each cylinder). All these conditions will help the engine to create maximum compression and to perform precise measurements.

When the service technician suspects after the power balance test that only one or two cylinders have extremely low compression, then only the spark plugs will be removed from those cylinders and a compression test will be performed. If the measured compression is quite low, it means that the engine has a problem with compression and it is necessary to perform an additional test of the cylinder. If the compression is reasonably close to the normal value from the specification, then the compression does not cause a problem and there is a possibility of error due to fuel or ignition that causes a power balance problem.

When performing a compression test, the final reading is not the only thing that is observed. If the piston rings are well sealed, then the first pressure pulse on the meter is at least half the pressure from the final reading.

When a low compression cylinder is found, put some engine oil (about one teaspoon) in the spark plug hole, start the engine a few turns, and check the compression again. If the compression is significantly increased, the problem is usually related to the piston rings or the walls of that cylinder, which indicates higher compression due to the short-term sealing ability due to the additional oil. Piston rings are an essential problem that usually requires the replacement of rings and engine repair. If the oil did not increase the compression, then the problem is probably a valve leak, a cylinder head seal, or a hole in the piston. The exact cause of the compression drop can be determined by a cylinder leak test.

Another way to measure compression is the dynamic compression test. This test uses a current clamp (inductive ammeter) connected to an engine tester that measures the current flow for the starter when the engine is started. As each cylinder appears on the compression stroke, the engine turns harder, so the electric starter is more loaded and draws more current. If each cylinder has the same relative compression, then the current pulse peaks will be similar. If the cylinder has low compression, then that instantaneous jump will be lower than the rest. This is a quick way to check if there is a compression problem. If in doubt then engine compression measurement should be performed.

To perform a cranking compression test, follow these steps:

1. Removing cables/coils from spark plugs: Remove high voltage cables from spark plugs or coils if they are placed directly on the spark plugs. Ground the high voltage conductor or disconnect the primary ignition circuit. For new vehicles, switch off the fuel injectors or remove the fuel pump fuse or relay.

2. Checking the battery: Check the condition of the battery. If the battery is low, recharge it or connect the starter to help start the engine.

3. Spark plug removal: Before removing, clean the area around the spark plugs to prevent dirt from penetrating inside the cylinder through the spark plug opening. Remove the spark plugs from the engine.

4. Connecting compression gauges: Install the appropriate adapter and compression meter hose in place of the removed spark plug (check the thread length and diameter for proper mounting). If separate, connect the hose to the compression gauge.

5. Compression measurement: The assistant should hold the throttle all the way and start the engine, check that the compression test needle has jumped at least five pulses. Read the first and final pressure values. Repeat the procedure with the same number of pulses for each cylinder.

6. Wet compression test: If any of the cylinders have low compression, perform a wet test by inserting a few drops of engine oil through the spark plug hole into that cylinder and measure the compression again. If the compression pressure increases significantly, the pistons are worn out. If the compression does not change much then the valve, cylinder head cover, or piston pin have a leak.

To perform a dynamic compression test, follow these steps:

1. Selecting a test program: Within the engine tester program, select and open the program for the dynamic motor compression test.

2. Connecting the engine tester: Connect the voltage terminals from the engine tester to the battery terminals. Take the appropriate current clamp (for measuring large nominal current) and place it around the plus conductor that goes from the battery to the starter. Pay attention to the direction of the measuring pliers.

3. Removing the fuel pump relay: Locate and remove the fuel pump relay. Start the engine to use up the fuel in the intake system.

4. Starting the engine: Start the engine while monitoring the program on the engine tester monitor. When the dynamic compression results appear on the monitor, stop starting the engine.

5. Analysis of measured values: Analyze the obtained results of dynamic compression and determine whether there is a suspicion that some of the cylinders have less compression. If in doubt then an engine compression measurement needs to be performed.

Text 7. Running Compression Test

Source: <https://autoedu.info/en/auto-mechanic/engine/engine-mechanical-testing/running-compression-test/>

A running compression test is performed during engine operation. Unlike the cranking compression test during start-up, which checks the ability of the cylinder to seal, the measurement during operation checks the engine's "breathing" ability to suck and expel air from the cylinder. For example, if the camshaft bearing is damaged, less air will enter or exit the cylinder, depending on whether it is an intake or exhaust camshaft.

The measurement is performed in two operating modes, at idle and engine acceleration. At idle, the throttle is closed and the compression pressure will be about half the starting pressure. In the second idle mode, the gas is suddenly added and subtracted, which leads to a sudden increase in the amount of air in the intake manifold. If the intake and exhaust systems are correct, the compression pressure should be increased by 80% of the starting pressure. If there is a flow restriction in the intake line the pressure will be significantly lower, and if there is a restriction in the exhaust line the pressure will be higher than 80%.

The compression test is performed by removing only the spark plug on the cylinder under the test. The compression gauge with the connection hose is placed in the opening of the removed spark plug. The engine is started and two measurements are taken when the engine is warm, at idle, and at a sudden, short acceleration. This measurement can detect worn camshaft tips, broken valve spring or the rocker arm, burned valves, or narrowed intake and exhaust manifold. In order to confirm the suspicion, it is necessary to do a visual inspection of the suspicious components.

To perform running compression tests, follow these steps:

1. Spark plug removal: Remove the spark plug on the cylinder you are testing and connect the spark plug cable to the ground using a test lead.
2. Fuel supply blocking: Remove the electrical outlet from the injector of the cylinder under test.
3. Idle measurement: Warm the engine to operating temperature. Reset the manometer via the meter bleed valve and read the compression value when the pressure stabilizes.
4. Acceleration measurement: Add abruptly (for about 1 second) and release the gas abruptly. Read the compression pressure value.
5. Repeat measurements on other cylinders: To turn off the engine. Remove the meter. Place and connect the spark plug. Connect the injector. Repeat the procedure of preparation and measurement of compression pressure for all other engine cylinders.
6. Analysis of measurement results: After completing the compression measurements on all engine cylinders, analyze the measured values. If in doubt, perform additional troubleshooting actions.

Text 8. Cylinder Leakage Test

Source: <https://autoedu.info/en/auto-mechanic/engine/engine-mechanical-testing/cylinder-leakage-test/>

A cylinder leakage test is used to determine the condition of the cylinder seal. Before the test, the engine is warmed up so that the engine oil can perform sealing in the cylinder. Then loosen the spark plugs by one revolution and start the engine to run for about 15 seconds at 1500 rpm. This removes soot deposits from the spark plug that can fall off during removal and get stuck between the valve and the valve seat, keeping the valve open and causing a false reading during the test.

For testing, the spark plug of the tested cylinder and the spark plugs of the adjacent cylinders are removed. Testing is performed when the piston is in the TDC position (top dead center) in the compression stroke. A plastic straw is inserted into the opening of the spark plug without fear of damaging the piston during adjustment. By turning the crankshaft, the piston is brought to TDC using a straw. After positioning the piston, we will not know whether it is a compression or exhaust stroke until testing is started. If it is in the exhaust stroke and the compressed air goes through the exhaust pipe, turn the engine one crankshaft and repeat the test.

In order for the testing to be successful, it is necessary for the piston, connecting rod, and camshaft to be in perfect alignment. Otherwise, the pressure on the piston from the leak tester will push the piston down and turn the crankshaft. If this happens, the intake or exhaust valve will open. Depending on how the piston ends by turning the crankshaft, and we will have a failed test.

Before testing, the filter housing, engine oil dipstick, and radiator cap (i.e., coolant tank) are removed. When the cylinder is under air pressure, it is necessary to perform a leak test by listening to the flow of air from the exhaust pipe, crankcase, cooling system, and engine seals.

To perform cylinder leakage test, follow these steps:

1. Preparing the engine for testing.
2. Spark plug removal.
3. Placing the piston in TDC.
4. Connecting test equipment.
5. Insert the compressed air.
6. Listening to the cylinder leak.

Text 9. Cylinder Head Repair

Source: <https://autoedu.info/en/auto-mechanic/engine/cylinder-head-repair/>

The cylinder head is exposed to various problems that adversely affect the operation of the engine. Constant thermal cycles of heating and cooling over time can distort the cylinder head causing leakage of compression, coolant, and oil. Possible faults are loosening of the cylinder head and valve seals, cracks on the cylinder head, deformation of the cylinder surface, burnt and distorted valves, or damage to the spark plug thread. With a camshaft motor, the camshaft bearing and camshaft bearing bore can be damaged.

When the seals loosen, coolant, oil, and compression gases penetrate other parts of the engine. The cylinder head must be removed and the seal replaced.



Cracks in the engine head are a serious problem that is very common due to its light construction. The main cause of cracks is thermal stress. During heating, the metal expands. The cylinder head is designed to withstand a certain expansion, and their fastening or set screws follow that expansion to a certain extension. As long as the engine is within the permissible operating temperature, the expansion and elongation are within the permitted limits. When a temperature increase occurs due to a fault in the cooling system, the elongation of the cylinder head and bolts exceeds the design limit. Over time, it can cause deformation of the metal, causing cracks to form. Depending on the location of the crack, coolant, oil, suction fuel, and air mixture or exhaust fumes can penetrate from the head into the surrounding engine parts. The block and cylinder head pressure test identifies hard-to-see cracks. The analysis of the detected crack determines the degree of damage and makes a decision whether to repair or replace the cylinder head.

Due to thermal stresses, the sealing surface of the cylinder head, sleeve bearing, and camshaft bearing opening may bend. Special machining procedures can be used to correct deformities caused on the cylinder head.

Damaged valves and valve seals can sometimes be repaired and reused. However, the price of new valves has dropped significantly so replacement is a common option for new vehicles. Older vehicles for which no spare parts are available to require refurbishment that includes cleaning, defect detection, and handling. The machining process requires special equipment and a skilled machinist.

Repair and repair of damage to the cylinder head are performed by experts using appropriate methods through machining.

Text 10. Removing Cylinder Heads

Source: <https://autoedu.info/en/auto-mechanic/engine/cylinder-head-repair/removing-cylinder-heads/>

The cylinder head is removed only after a detailed examination and determination of a fault in the head itself, the associated elements, or the part that requires the cylinder head to be removed to access it (such as the engine block, and piston). Before removing the cylinder head, it is necessary to get acquainted with the procedure/steps listed in the information system for that vehicle because each engine is different. Some manufacturers require that the head screws be released according to a certain pattern and at a certain temperature. Failure to follow the manufacturer's instructions may result in damage to the cylinder head. This section describes the procedures for overhauling, testing, and determining the fault on the cylinder head.

To remove the cylinder head, follow these steps:

1. Determining the procedure: Refer to the appropriate service information for the cylinder head removal procedure. Determine if the head screws must be removed in the correct order.

2. Remove screws: Follow the above procedure to remove all head screws. When it comes to the V-engine, put a mark on one head to know where it is going after the overhaul.

3. Separation from the engine block: When the seal is glued between the head and the engine block, replace the two screws with two to three turns. This will prevent the head from falling when detached from the engine block.

4. Removing the cylinder head: Remove the safety screws from the head. Carefully and safely remove the cylinder head from the block. Place the cylinder head in a pre-prepared place.

Text 11. Disassembling and Cleaning a Cylinder Head

Source: <https://autoedu.info/en/auto-mechanic/engine/cylinder-head-repair/disassembling-and-cleaning/>

After removal, it is necessary to disassemble and clean the cylinder head for the inspection and repair process to be more efficient. You cannot have a good repair on the cylinder head if there are pieces of sludge and dirt that cover the damage or constantly fall into the inspection and repair area. Cylinder head cleaning usually involves mechanical cleaning with a scraping tool, such as a gasket scraper. Aluminum heads are scraped with a non-metallic tool such as a plastic or silicone scraper.



Gasket Scraper Set

In most cases, the disassembled cylinder head must be chemically cleaned in a spray tank, hot tank, cold tank, ultrasonic cleaner, or specially designed oven. Follow the equipment manufacturer's recommendations when using a particular type of cleaner.

To disassembling and cleaning a cylinder head, follow these steps:

1. Checking and washing the cylinder head: Perform a visual inspection of the head for damage. Thoroughly wash the cylinder head from oil and dirt, by hand or in a washing container. After washing, allow the cylinder head to drain and dry.

2. Gasket removal: On the cast iron head, cleaning is done with a flexible abrasive pad or scraper. If it is an aluminum head, use plastic or silicone scrapers. Apply the manufacturer's recommended procedure for cleaning joints.

3. Valve removal: Using a suitable tool, compress the valve spring and remove the fuse. Remove the spring retainer and valve spring. Fuses and springs disposed of in boxes. Remove the valves and place them on a special plate for disassembling the head with the marked order of the cylinders.

Text 12. Cylinder Head Inspection

Source: <https://autoedu.info/en/auto-mechanic/engine/cylinder-head-repair/cylinder-head-inspection/>

An inspection of the cylinder head follows when it is thoroughly cleaned. Checks are connecting surface flatness, cracks, deformation, and wear of the cylinder head parts are checked.

First, a visual inspection checks that there is no visible damage to the cylinder head casting. Carefully inspect the outer surface and cavities of the cylinder head for any damage or deformation. Major damage and deformation can be visually detected without the

use of other test methods. Any detected irregularities should be marked, consider the level of damage, and determine further action.

After visual inspection, the condition of the sealing surface of the cylinder head is checked.

Using flat bars (ruler) measures the deformation of the sealing surfaces of the cylinder head. A simple method is to use a light source that is placed behind the ruler. The light marks the unevenness that appears between the ruler and the sealing surface. This is how we can estimate the degree of deformation of the cylinder head surface.

Calibrated sheets are used to determine the degree of distortion more precisely. The ruler is placed on the sealing surface and the gap between the ruler and the flat plate is checked with a calibrated sheet of 0.03 mm. If the calibrated sheet cannot pass along the entire length of the ruler, then the check on the other part continues to ensure reading over the entire sealing surface of the cylinder head. When a calibrated sheet passes in some part, it means that there is a deformation. Increasing the value of the leaf (0.05 mm, 0.07 mm) determines the size of the deformation. The last leaf that passes under the ruler is the size of the deformation of the sealing surface of the cylinder head. Finally, the curvature value read is compared with the limit values from the service catalog for that motor. The typical allowable distortion is up to 0.07 mm.

To cylinder head inspection, follow these steps:

1. Visual inspection: Inspect the cylinder head in detail for any visible deformation and damage. Mark any irregularities and assess the degree of damage. Identify further activities.

2. Checking flatness sealing surfaces: Place a flat bar (ruler) over the entire sealing surface of the cylinder head. Place a strong light source behind the batten and observe the unevenness. Mark larger deviations. Use the measuring sheets to determine the deviations between the ruler and the surface. Measurements are performed along the length, diagonally, and width. Note any deviation that is greater than the allowable value and determine further actions to repair the unevenness.

Text 13. Cylinder Head Pressure Testing

Source: <https://autoedu.info/en/auto-mechanic/engine/cylinder-head-repair/cylinder-head-pressure-testing/>

After cleaning and washing, a detailed check of the cylinder head follows, and one of the ways to check is by the air pressure method. The flatness of the connecting surfaces, cracks, deformation, and wear of the cylinder head parts are checked.

The appearance of cracks in castings is the result of stress or stretching. Cracks occur due to:

- defects in the casting structure during the cylinder head casting;
- fatigue of the material, small cracks appear first, which spread due to constant stress;
- lack of material stiffness;
- mechanical damage from the impact of a solid, hard object;
- the constant impact of the valve on the seat and breakage of the thin-walled cast iron;
- sudden cooling of the heated part by a burst of cold water or air;
- overheating due to improper operation of the engine cooling system.

Some cracks can be detected by visual inspection. However, many cannot be seen easily, so special methods and equipment are used to detect cracks in the cylinder head.

Finding a pressure crack is done in the same way as finding a hole in a tire. All coolant passages on the cylinder head are closed with plugs or closures. Compressed air is introduced into the coolant space. The air inlet is closed. Then the cylinder head is immersed in water. If there is a crack, air will come out through it and create bubbles in the water. The place where bubbles form is the place where the engine head bursts.

To cylinder head pressure testing, follow these steps:

1. Closing the coolant chamber: Close all coolant passages on the cylinder head with plugs and caps.
2. Insert the compressed air: Insert compressed air into the closed cylinder head coolant chamber. Close the air intake.
3. Immersion of the cylinder head: Immerse the compressed air cylinder head inside the cylinder chamber in a water tank.
4. Locate the cracks: Monitor the submerged cylinder head for bubbles. If there are bubbles, locate and mark the place of air leakage.

Text 14. Cylinder Head Magnaflux Crack Detection

Source: <https://autoedu.info/en/auto-mechanic/engine/cylinder-head-repair/cylinder-head-magnaflux-crack-detection/>

After cleaning and washing, a detailed check of the cylinder head follows, and one of the ways to check is by the magnetic method – magnaflux crack detection. The flatness of the connecting surfaces, cracks, deformation, and wear of the cylinder head parts are checked.

The appearance of cracks in castings is the result of stress or stretching. Cracks occur due to:

- defects in the casting structure during the cylinder head casting;
- fatigue of the material, small cracks appear first, which spread due to constant stress;
- lack of material stiffness;
- mechanical damage from the impact of a solid, hard object;
- the constant impact of the valve on the seat and breakage of the thin-walled cast iron;
- sudden cooling of the heated part by a burst of cold water or air;
- overheating due to improper operation of the engine cooling system.

Some cracks can be detected by visual inspection. However, many cannot be seen easily, so special methods and equipment are used to detect cracks in the cylinder head.



Magnetic particle testing kit

A strong permanent magnet or electromagnet is used. When a magnet is placed on the cylinder head, the magnetic field propagates through the metal between the ends of the magnet. If between the magnetic poles there is a crack in the gap government strong magnetic field. Metal sawdust is sprinkled on the motor block between the two poles of the magnet. A strong magnetic field draws dust into the crack gap. In this way, a crack is marked on the tested part of the cylinder head. During the test, the magnet is placed in two different positions at an angle of 90°. The cracks that are in the direction of the propagation of the magnetic field line do not react and do not attract magnetic dust.

The procedure is repeated along the entire length of the cylinder head.

To cylinder head check is by the magnet method, follow these steps:

1. Installing the magnet on the cylinder head: Place the magnet on the top of the cylinder head. Sprinkle magnetic powder between the poles of the magnet. Check the surface between the poles for cracks.

2. Rotate the magnet: On the same tested part of the cylinder head, place the magnet in the new position at an angle of 90° to the previous position. Sprinkle the magnetic powder between the poles of the magnet again and check for cracks.

3. Repeat procedure: Move the magnet one by one along the cylinder head and repeat the procedure of sprinkling the magnetic powder and checking for cracks. It is necessary to perform two tests on each part by placing the magnet at an angle of 90°.

Text 15. Valves and Valve Seat Inspection

Source: <https://autoedu.info/en/auto-mechanic/engine/cylinder-head-repair/valves-and-valve-seats-inspection/>

Inspection of the condition of valves and the valve seats is performed after disassembling the cylinder head and removing the valve. This is a mandatory procedure before assembling the cylinder head.

Valves and valve seats work in very poor conditions, and they should be carefully inspected each time the cylinder head is removed from the engine. Valves can burn or deform, leading to problems with lack of ignition. Also, the top of the valve can wear out due to a lack of lubrication, which leads to a knocking sound. The valve stem can wear out, which leads to the penetration of engine oil into the engine cylinder.

After removing the valve from the cylinder head, the valves and seats should be visually inspected for cracks, burn marks, signs of leakage, and damage to the valve face, stem, and tip. If any of the problems are detected, the valve must be replaced and the seat will be replaced or repaired depending on the degree of damage. If there are no obvious visual defects, then the valve and seat are measured and compared with specific values.

The diameter of the valve stem should be measured in the part that passes through the valve guide. The measurement is performed with a micrometer and the measurement results are compared with those given in the service specifications. Some valves come with a pointed valve stem, where the end of the stem is slightly narrower next to the valve head to allow the stem to expand on warmer engines. Valve margins are measured with a machinist's rule to ensure they are within specifications. It also measures the width of the valve seat and compares it to specifications.

For valves and valve seats inspection, follow these steps:

1. Visual inspection of the valve: Visually inspect each valve for signs of burning, warping, and excessive wear on the face, stem, and tip. If found, replace the valves with new ones.

2. Visual inspection of the valve seat: Visually inspect each valve seat for signs of burning, leaks, or excessive wear. If found, the seat must be machined or replaced.

3. Measure valve stem diameter: Use a micrometer to measure the diameter of the stem of all valves in three places in the part that passes through the valve guide and calculate the average value. Compare the measured values with the specifications and determine the necessary actions.

4. Margin measurement: Measure the valve margin with a machinist's rule and record the readings. Measure the width of the valve seat with a machinist's rule and record the readings. Compare the measured values with the specifications and determine the necessary actions.

Text 16. Inspecting Valve Guides and Clearance

Source: <https://autoedu.info/en/auto-mechanic/engine/cylinder-head-repair/inspecting-valve-guides/>

Valves and valve guides are exposed to high temperatures and pressures which leads to wear of their surface. Therefore, it is necessary to inspect the valve guide. If they wear out a lot, the engine oil passes between the guide wall and the valve stem, entering the combustion chamber. If the wear is large, then the valve has too much lateral travel in the guide so that the valve head does not close properly and the tip does not close on the valve seat. This leads to leakage of the mixture from the compression volume next to the valve and then to the absence of ignition in that cylinder. The valve and valve guide are checked with a micrometer or comparator.

A ball gauge is used to measure the top, center, and bottom of the valve guide for measuring with a micrometer. The ball of the meter is placed in the guide and spread until both sides of the meter touch the inside of the guide. It is then removed from the guide, and the diameter is measured with a micrometer and recorded. Three measurements are performed for each guide. The reading in the middle is subtracted from the final readings to determine the narrowing of the guide. The smallest value (usually in the center of the guide) determines the inside diameter.



Telescopic gauge

The diameter of the valve stem is also measured and recorded. If the diameter of the valve stem is within the specifications, the clearance is calculated. The difference between the guide and the valve stem is the valve clearance. The clearance should be within the manufacturer's specifications.

A comparator is used to measure valve clearance. The measurement is performed when the valve is in the valve guide and in the fully open position. The comparator indicator is placed on the cylinder head near the valve head. The comparator needle is placed on

the valve head to measure the lateral movement of the valve. The valve moves laterally by observing the movement of the stroke value on the comparator indicator. The maximum measured stroke is the valve clearance and is compared to the specifications.

To inspecting valve guides and clearance, follow these steps:

1. Guide and valve cleaning: Clean the valve guide and valve with solvent and brush if they have not already been cleaned.

2. Measuring the inner diameter of the guides: Insert the ball gauge into the guide and extend it until it touches both sides with a small amount of resistance. Carefully remove the ball gauge and measure it with a micrometer. Measure each guide in three places. Record and calculate measured values.

3. Measuring the diameter of the valve stem: Measure the diameter of the valve stem at the top, center, and bottom of the wear surface and record the readings. Calculate the clearance for each guide and valve. Compare the obtained clearance results with the specifications and determine the necessary actions.

4. Measuring of the gap with a comparator: Install the valve in the guide to the fully open length. Place the comparator needle on the valve head so that it can measure lateral displacement. Move the valve sideways and measure the valve stroke. Compare the clearance with the specifications and determine all the necessary actions.

Text 17. Inspecting Valve Springs

Source: <https://autoedu.info/en/auto-mechanic/engine/cylinder-head-repair/inspecting-valve-springs/>

Inspecting valve springs have three measurements: spring height check, checking for squareness, and measuring the installed pressure. A deformed spring leads to wear of the valve stem and guide.

The valve spring must have the appropriate size and thrust, as this depends on the safe closing of the cylinder and the efficient operation of the engine. The springs must close the valves quickly and firmly. That is why it is important to check the condition of the valve spring during the overhaul of the cylinder head and determine that they meet the set specifications before they are reassembled.

By measuring the height of the spring, it is checked whether the spring has the correct height and that there is no fatigue of the material. The height deviation from each other must not exceed 1 mm.

Checking for squareness is a test of the general condition of the spring to compress and load the valve evenly during operation. The spring is placed on a perfectly flat surface and a try square is placed next to it. Rotate the spring around its axis to check for deformation. When there are irregularities, measure deviations. If the clearance is greater than 1.5 mm, replace the spring.

Thrust measurement is performed at the installed spring height. This determines how much pressure the spring creates when it is at its installed height on the cylinder head. This thrust is measured using a valve spring tester by compressing the spring to the installed height. The installed height for the tested spring is obtained from the information system or measured during disassembly. The tester measures the spring pressure when it is compressed. The deviation of the valve thrust force from the given value from the specification must not exceed 0.5 kg. When the value of the thrust force is not available, then compared with each other all the obtained values and assess their mutual deviation. The spring whose thrust is quite different from the average of all valves needs to be replaced.

To inspecting valve springs, follow these steps:

1. Height check: Use a movable gauge (caliper) to measure the spring's free height and compare the measured values with the specifications for that motor. If the spring height is outside the specific value, replace the spring. Repeat this procedure for all other springs. When you do not have the necessary data, then compare all the measured sizes and estimate the deviation of the spring height.

2. Checking for squareness: Place the spring on a flat surface. Rotate the spring and check with a try square for any deviations. Measure these deviations. If the deviations exceed the limit value (1.5 mm), replace the spring.

3. Measuring thrust: Read or measure the installed spring height on the cylinder head. Install the valve spring to the valve spring tester. Pull the spring lever to compress the spring to the installed height. Note the thrust generated by the spring and compare it with the specifications. A spring that is out of specification needs to be replaced. When you do not have the required thrust force value, compare all the results obtained and estimate the average deviation.

Text 18. Hydraulic Braking System: Brake Fluid Handling

Sources: <https://autoedu.info/en/auto-mechanic/brakes/hydraulic-braking-system/>,
<https://autoedu.info/en/auto-mechanic/brakes/hydraulic-braking-system/brake-fluid-handling/>

Most vehicles use a hydraulic braking system. Incompressible brake fluid is used to transmit the braking force. Pressing the brake pedal creates pressure in the hydraulic system, which is transmitted through the brake fluid through the lines and hoses to the braking unit.



The correctness of the vehicle brakes depends on the correctness of the hydraulic system. This system must always be ready to transmit the brake order to the end braking units.

The hydraulic braking system requires periodic inspection and maintenance of the elements. When a malfunction is suspected, it is immediately checked, detected, and rectified. During the service, it is necessary to adhere to the manufacturer's recommendations for a given vehicle in the knowledge of operating procedures and proper use of equipment and tools.

The brake fluid is poisonous and hygroscopic and requires careful handling. Driving safety depends on the condition and quality of the brake fluid. Therefore, the brake fluid must be regularly checked and changed. Failure to do so may result in damage to the hydraulic braking system and a safety hazard.

During each engine oil change, the brake fluid level is inspected. If it is below the minimum level in the tank, it is necessary to identify and correct the cause of the low liq-

uid level. It is common for the brake fluid to be replenished only when the brakes are being repaired or serviced.

Brake fluid has hygroscopic properties, which means that it absorbs moisture from its environment. When the brake fluid is saturated with moisture, its boiling point is lowered and the risk of brake system failure at extreme loads increases.

The brake fluid should be stored in the original container in a clean, dry place at or below room temperature, preferably separate from similar storage of petroleum products or liquid materials used for maintenance. Always use the original packaging, which should be tightly closed to avoid water absorption.

Important notes when handling brake fluid:

- Brake fluid is toxic and belongs to special waste;
- Caution when replacing;
- Damages varnishes and plastics. Always rinse spilled liquid with water;
- Store the old liquid in special packaging and do not mix with old oil;
- The color of the brake fluid does not indicate quality;
- Brake fluid should be stored in a dry, cool, and well-ventilated place.

To select, operate, store and fill the brake fluid to the appropriate level, follow these steps:

1. Information on the type of brake fluid: See which type of brake fluid is used in the service information system for a given vehicle.

2. Check brake fluid level: Wipe the master cylinder reservoir cover to prevent moisture or dirt from entering the hydraulic part of the brake system. The fluid should be close to the full mark or about 1.5 cm from the top of each chamber when there is no mark. If the brake fluid level is not close to the full mark, you will need to identify the cause of the lower level.

3. Adding brake fluid: When you are sure that there is no problem with fluid loss, add the recommended brake fluid to bring the level to the full mark.

4. Closing the reservoir: Replace the cover and check that it is installed correctly. Check for any leaks or problems around the master cylinder. Dilute spilled brake fluid with clean water. Do not rub the brake fluid, as this may damage the paint.

Text 19. Testing Brake Fluid with a Multimeter

Source: <https://autoedu.info/en/auto-mechanic/brakes/hydraulic-braking-system/testing-brake-fluid-1/>

Testing of brake fluid for the presence of moisture can be measured with a multimeter. The maximum permissible moisture content in the brake fluid is 3%. Over this value, it is necessary to replace the brake fluid because the braking efficiency is reduced. By measuring the voltage as a galvanic reaction of the brake system, the water level in the brake fluid is determined.

Most vehicle manufacturers use a combination of different metals to make the braking system, aluminum in the pistons and housings, and steel in the brake lines and cylinders on the wheels. When moisture mixes with the brake fluid, a galvanic reaction (corrosion) occurs. The higher the moisture content in the brake fluid, the greater the corrosion and the stronger the galvanic reaction. A voltmeter measures the galvanic reaction voltage in the braking system. The magnitude of the measured voltage depends on the moisture levels in the liquid. The higher the percentage of moisture, the higher the voltage.

To testing brake fluid with a multimeter, follow these steps:

1. Preparation for measurement: Remove the brake fluid reservoir cap. Adjust the multimeter to measure direct voltage (DC). Connect the red cable to the plus/voltage connector and the black to the minus/common connector of the multimeter.

2. Voltage measurement: Place the tip of the red measuring probe in the brake fluid, and connect the black one to the unpainted part of the metal housing of the master brake cylinder. Wait for the measured voltage value to calm down.

3. Testing analysis: Analyze the measured voltage value. Voltages up to 0.3V indicate that the percentage of moisture in the brake fluid is lower than allowed. However, when the measured voltage is higher than 0.3V, it means that there is too much moisture and that the brake fluid must be replaced.

Text 20. Brake Fluid Boiling Point Test

Source: <https://autoedu.info/en/auto-mechanic/brakes/hydraulic-braking-system/brake-fluid-boiling-point-test/>

The brake fluid must have a high enough boiling point to avoid evaporation in critical parts of the brake system such as the disc and the brake drum. Vehicle deceleration is performed by friction in the brake units where enormous heating occurs. If the temperature of the brake unit exceeds the boiling point of the brake fluid, the fluid boils. The consequence of boiling causes difficult transmission of brake pressure and leads to failure of the brake system.

Moisture reduces the boiling point of the brake fluid. The higher the moisture content, the lower the boiling point. Up to 3% tolerates moisture content. For example, moisture-free DOT3 brake fluid has a boiling point of 205°C, with 1% water 188°C, with 2% 160 C, while with 3% it will decrease to 145°C.

The table below shows the boiling points for different types of brake fluid (DOT3, DOT4, DOT5, DOT5.1) for liquids without moisture and with 2% moisture content:

Type	Dry boiling point	Wet boiling point (2%)	Chemical composition
DOT3	205°C	140°C	Glycol Ether
DOT4	230°C	155°C	Glycol Ether / Borate Ester
DOT5	260°C	180°C	Silicone
DOT5.1	260°C	180°C	Borate Ester / Glycol Ether

There are various devices for measuring the boiling point of brake fluid. So, we have a brake fluid boiling point tester that shows the limit and measured temperature on the display, while the simplest testers via LED indicate whether the brake fluid is good or bad.



Brake fluid boiling point tester

To brake fluid boiling point test, follow these steps:

1. Preparation for measurement: Remove the cover and sieve from the brake fluid reservoir. Using a syringe, take some of the brake fluid from the reservoir and squeeze it into the measuring cup.

2. Boiling point measurement: Insert the saw probe into the brake fluid sample. Turn the tester on. Select the type of brake fluid and measure the boiling point.

3. Analysis of measurement results: Analyze the obtained value of the boiling point of the brake fluid. If the value is lower than allowed, replace the brake fluid. Turn off and clean the tester. Return the brake fluid sample to the reservoir. Close the tank with a cover.

Text 21. Testing Brake Fluid with a Refractometer

Source: <https://autoedu.info/en/auto-mechanic/brakes/hydraulic-braking-system/testing-brake-fluid-3/>

The brake fluid test with a refractometer is a procedure for determining the moisture content. The brake fluid has the bad property of being hygroscopic because it absorbs water from the atmosphere. The brake fluid begins to absorb moisture from the moment it is placed in the system. The liquid absorbs moisture through microscopic pores in rubber hoses, seals, and when exposed to air. The problem is bigger in areas with a humid climate.

Water in the brake system reduces braking efficiency. Even a small amount of moisture dampens the transmission of brake pressure to the end brake units, endangering vehicle safety. Also, moisture promotes corrosion on the internal metal parts of the brake system. Therefore, manufacturers prescribe regular replacement of brake fluid every 2 to 4 years. However, it is recommended to check the condition of the brake fluid regularly for moisture. The permissible moisture content in the brake fluid is up to 3%. When it is determined during the check that the share is higher than the allowed value, it is necessary to replace the brake fluid.



Refractometer

A refractometer is a measuring device that checks and measures the presence of water in the brake fluid. The refractometer is a precise optical instrument for measuring the moisture in the brake fluid. Fast and accurate measurement can only be done from two drops of brake fluid.

Pipette a small sample of brake fluid from the reservoir. Lift the glass lid of the refractometer and place one to two drops on the prism. Close the lid so that the liquid spreads evenly over the entire surface of the prism without air bubbles or dry areas. Wait about 30 seconds for the sample temperature to equalize with the environment. Redirect the refractometer so that daylight falls on the sample. The level of the blue-white line is observed through the eyepiece, which must not exceed the limit value of the moisture content in the brake fluid. After reading, carefully lift the lid and clean the measuring prism and lid with a soft towel (paper towel or soft cloth). After drying, place the refractometer in a suitable box.

The refractometer is calibrated periodically. For calibration, we use new brake fluid from the newly opened packaging. Place two drops of new brake fluid on the measuring prism and wait 30 seconds for the temperature to equalize with the environment. We observe the position of the measuring line through the eyepiece. Set the measuring line to the zero position via the calibration screw. Now the refractometer is calibrated but only for such an ambient temperature. When the temperature is lower or higher by 5°C, the measuring device is calibrated again.

To testing brake fluid with a refractometer, follow these steps:

1. Preparation for measurement: Remove the cover and sieve from the brake fluid reservoir. Pipette the brake fluid sample. Lift the glass lid and apply one or two drops of liquid to the measuring prism of the refractometer. Gently lower the lid and wait for about 30 seconds.

2. Measurement of moisture levels: Point the refractometer towards the light source and see the position of the blue-white line on the measuring scale through the eyepiece. If the humidity level is above the limit value, it is necessary to take steps to replace the brake fluid.

3. Completion of measurement: After measuring, clean the prism and the glass cover with a damp soft towel. Clean the pipette and close the brake fluid reservoir with a lid. When the refractometer dries, store it in a suitable box.

Text 22. Manual Bleeding

Source: <https://autoedu.info/en/auto-mechanic/brakes/hydraulic-braking-system/manual-bleeding/>

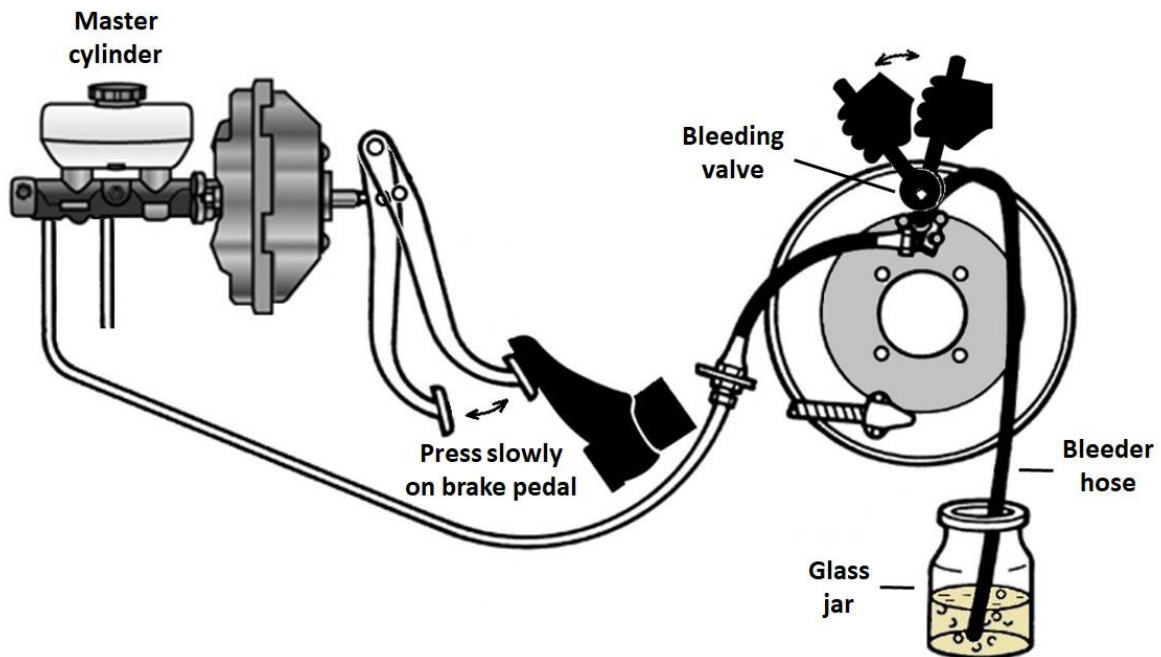
Since the brake fluid cannot compress, it transmits the brake pressure through the hydraulic system quickly and without loss. However, when air enters the system, the brake pressure transmission is disturbed. The air is compressible, reduces the volume under pressure, and does not transmit thrust through the system. The brakes will be porous and ineffective. That's why it's done bleeding brake systems.

Bleeding the hydraulic brake system means that only brake fluid remains in the system. One way is to manually bleed when the assistant presses the brake pedal and you open and close the air release screws on the wheels. This ensures that air and old brake fluid are expelled from the hydraulic brake system.

Manual bleeding requires the least amount of equipment and tools, but it takes more time to expel a larger amount of brake fluid through the system. It is also less effective in removing trapped air in systems that have high points in the brake lines or in vehicles that have a large vertical drop between the master cylinder and the brake blocks, such as a truck. This method is best when only a small amount of brake fluid needs to be drained. Such as after replacing the wheel brake unit or when more expensive equipment is not available.

During manual air release, you need to have an assistant who will slowly depress and release the brake pedal at your request. Successful bleeding requires clear communication between you and your assistant.

Bleeding starts from the brake unit to the point furthest from the master cylinder. Connect a transparent hose to the bleeding screw. Insert the other end of the hose into a transparent container. Ask the assistant to depress the brake pedal. Unscrew the screw from one quarter to half a turn. Pay attention to the old brake fluid and air bubbles coming out of the hose from the screw.



Manual bleeding

When the brake fluid leak stops, gently close the bleeding screw. The assistant should slowly release the brake pedal. This allows the master brake cylinder to draw new brake fluid from the reservoir, ready to bleeding again.

Repeat the previous three steps until there are air bubbles in the brake unit. Close and tighten the screw to the manufacturer's specifications. Make sure that the tank is not left without brake fluid during the air release, as this draws air into the brake system. If this happens, it will be more difficult to bleeding from the hydraulic brake system. Check the level in the master cylinder reservoir, top-up, and close again with the tank cap.

Repeat this procedure for each wheel brake unit, moving closer to the master cylinder (one wheel at a time) until the air is removed and the brake pedal is not porous. You may need to start the engine o check that the brake pedal is still firm when a vacuum brake booster is in operation.

To manual bleeding from the brakes, follow these steps:

1. Preparation: Check the brake fluid levels in the reservoir and refill if necessary. Prepare vehicle and brake unit for unobstructed access to the air bleeding valve. Remove the protective cover from the valve and connect the hose to the container on the air bleeding valve. The assistant is in the driver's seat of the vehicle.

2. Manual bleeding: The assistant presses the brake pedal lightly. Unscrew the bleeding valve and observe the brake fluid through the hose and in the reservoir. When the swelling stops, close the valve and ask the assistant to release and press the pedal again. Repeat the procedure until you have expelled all the air. Always check the brake fluid level in the reservoir during bleeding. If necessary, repeat the bleeding procedure on all brake units.

3. Check the brake system: Refill the brake fluid reservoir. Start the engine to activate a vacuum brake booster and check the condition of the brake system by depressing the brake pedal. Check once more that the bleeding valve is closed. Install the protective cover on the valve.

Text 23. Pressure Bleeding

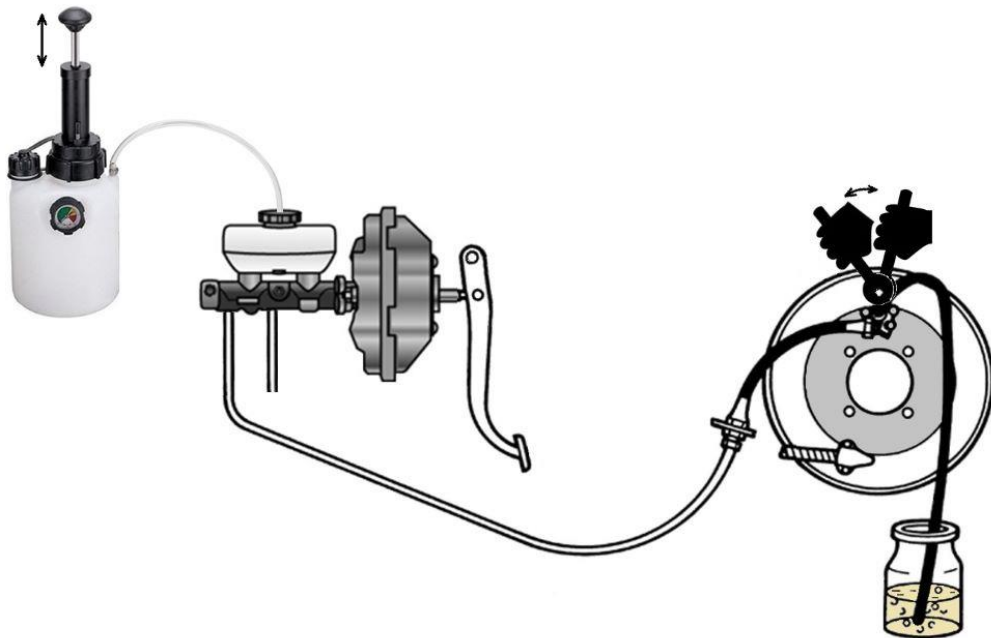
Source: <https://autoedu.info/en/auto-mechanic/brakes/hydraulic-braking-system/pressure-bleeding/>

Replacement and bleeding of the brake fluid can be done under pressure. A hand pump with a tank is used for that. The advantage of this method is that you can replace the brake fluid on your own without an assistant. The pressure bleeding equipment consists of a canister, a manual pump for creating pressure in the canister, a manometer, and a cover with a hose that replaces the cover of the brake fluid reservoir.



Pressure brake bleeding and flushing kit

Find out in the information system or manual what type and amount of brake fluid are required for a given vehicle.



Replacement of brake fluid under pressure

Clean the brake fluid reservoir cover and the area around it. We remove the lid and put the lid with the hose from the canister in its place. When we have made sure that the lid with the hose is well placed, we raise the air pressure in the empty canister to 1 bar with the help of a hand pump. Once again, check the lid for air leaks and monitor the manometer. If the created pressure is constant, we lower the pressure in the canister, open it

and add new appropriate brake fluid. It is to pour 0.3 to 0.5 liters of more brake fluid than the required amount into the canister. We close the lid and use the pump to re-create the pressure in the canister at 1 to 1.2 bar maximum because higher pressure can damage the internal seals in the brake system.

Brake fluid replacement starts from the brake unit to the point furthest from the master cylinder. We place a hose on the bleeding valve. The other end of the hose is in a transparent container. We open the valve by unscrewing the screws a quarter to a half turn. We follow the brake fluid that flows into a transparent vessel. When the brake fluid is clear and there are no more bubbles, we close the bleeding valve.

Repeat the brake fluid replacement procedure for each brake unit by moving towards the master brake cylinder.

After the brake fluid replacement procedure, start the engine and check that the brake pedal is firm when a vacuum brake booster is in function.

To replace the brake fluid under pressure, follow these steps:

1. Preparing for replacement: Connect an empty canister to the brake fluid reservoir. Use a hand pump to create a pressure of 1 bar and check for leaks. If the seal is good, lower the pressure and pour the appropriate type and amount of brake fluid into the canister. Pump again to create a pressure of 1-1.2 bar.

2. Replacement: Place a hose and a container for draining the brake fluid on the farthest brake unit. Unscrew the bleeding valve and monitor the drained brake fluid. When the liquid is clear and is no more bubbles, close the bleeding valve. Remove the hose from the valve.

3. Repeat the procedure: Repeat the brake fluid replacement procedure for each brake unit by moving towards the master brake cylinder. Periodically check brake fluid level and canister pressure.

4. Check the brake system: After replacing the brake fluid, lower the pressure in the canister, remove the hose cap, and return the original cap to the tank. Start the engine and, by depressing the brake pedal, check that there is no decay and that the pedal is firm.

Text 24. Vacuum Bleeding

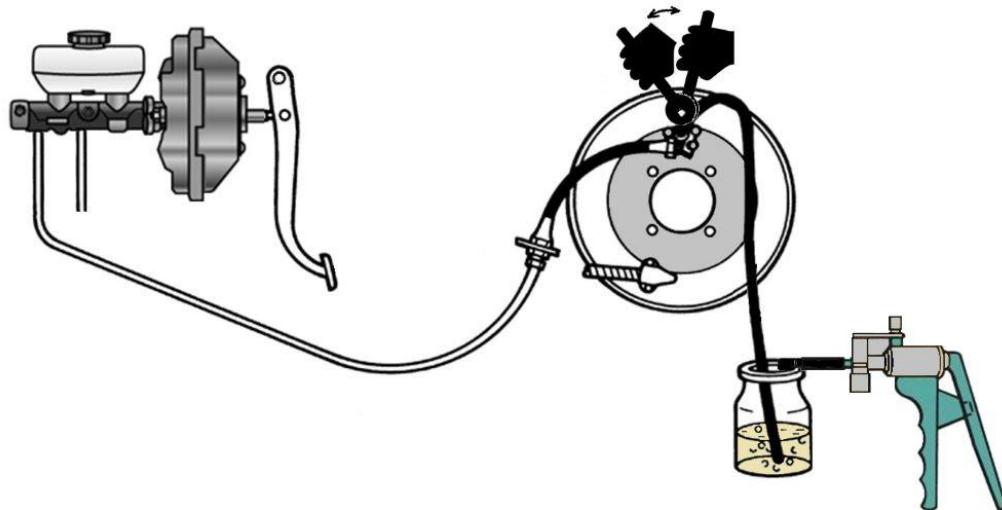
Source: <https://autoedu.info/en/auto-mechanic/brakes/hydraulic-braking-system/vacuum-bleeding/>

Extraction of air and old brake fluid from the brakes can be done without assistance by the vacuum bleeding using a vacuum pump.



Vacuum pump

The vacuum bleeding set consists of a manual vacuum pump, a transparent container with appropriate caps, hoses, and a set of connections and adapters for connection to the brake system.



Vacuum bleeding

There is a transparent container between the vacuum pump and the bleeding valve. Place the switch on the pump in the position to create a vacuum. We manually create a vacuum in the vessel via a pump. When the bleeding valve is opened, the vacuum draws brake fluid from the hydraulic system into the reservoir. We can monitor the movement of fluids through the intestines and in the vessel. When the brake fluid is clear and does not contain air bubbles, close the bleeding valve, neutralize the vacuum in the vessel via the switch on the pump and separate the hose of the vacuum pump from the valve.

First, the air is extracted through the brake unit to the point furthest from the master cylinder to the nearest. During the extraction of air, we constantly check the level of brake fluid in the tank. When the brake fluid level is below the minimum, there is a risk of air being sucked into the hydraulic system via the master cylinder.

To vacuum brake bleeding, follow these steps:

1. Preparation for bleeding: Prepare and connect the vacuum pump to the brake unit air extraction valve at the point. Start from the farthest brake unit from the master cylinder. Before bleeding, check the brake fluid level in the tank.

2. Vacuum bleeding: Unscrew the bleeding valve on the brake unit by a quarter to a half turn. Manually create a vacuum in the brake fluid extraction vessel via the vacuum pump. Observe the brake fluid for bubbles. Close the valve when there are no more air bubbles in the liquid. Remove the hose from the valve. Repeat the previous procedure on each brake unit to a point from the farthest to the nearest master cylinder. Periodically check the brake fluid level in the master cylinder reservoir and refill the appropriate level.

3. Check the brake system: After completing the bleeding from the brake fluid, double-check that all bleeding valves are properly closed and fit protective covers. Fill the tank to the appropriate level. In the case of a system with a vacuum brake booster, start the engine. By depressing the brake pedal, check that there is no failure and that the pedal is firm.

Text 25. Checking the Brake Pedal

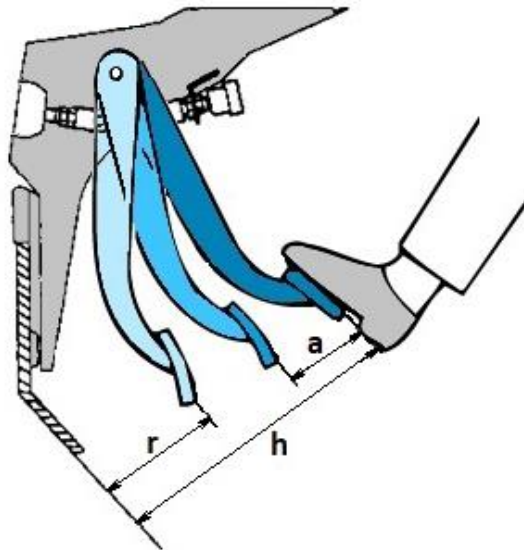
Source: <https://autoedu.info/en/auto-mechanic/brakes/hydraulic-braking-system/checking-brake-pedal/>

Checking and adjusting the travel of the brake pedal is crucial for proper braking. Three different pedal positions are defined to be checked: height (h), free play (a), and reserve height (r).

Adequate height (h) ensures that the primary thrust force is fully transmitted to the pedal even if half of the brake fluid leaks out of the hydraulic system. In other words, there needs to be enough height to do the braking before the pedal touches the floor. Brake pedal height is measured from the top of the pedal to the floor of the vehicle.

Free play (a) is the distance from the top to the resistance of the pedal push. This is actually the distance between the brake pedal connection and the master cylinder piston. The measurement is performed by lightly pressing the hand on the pedal until resistance is felt. The measured movement is the free travel of the brake pedal.

The reserve height (r) is the distance from the floor to the end position of the pressed pedal. The reserve height is required if there is air in the hydraulic system or a leak occurs, so the pedal perishes and has a higher travel required for braking.



Measure brake pedal height

To checking the brake pedal, follow these steps:

1. Preparing to check: Read the actual values of the brake pedal position for the vehicle you are working on from the information system. Remove all floor mats or anything lying on the floor near the pedal.
2. Height measurement: Use a meter to measure the height between the free pedal and the floor of the vehicle cab. Compare this reading with the specifications and determine all necessary actions if the values do not match.
3. Free play measurement: With a light pressure of the hand, push the brake pedal to the position when strong resistance is felt and measure that stroke. Compare this reading with the specifications and determine all necessary actions if the data do not match.
4. Reserve height measurement: Apply the parking brake and start the engine. This will allow a vacuum brake booster to operate normally. Foot to press a certain force to the brake pedal end. Measure the height from the floor to the pedal, which is a reserve height. If the values do not match, determine the appropriate actions.

Text 26. Testing the Master Cylinder

Source: <https://autoedu.info/en/auto-mechanic/brakes/hydraulic-braking-system/testing-master-cylinder/>

Testing the master cylinder comes down to visually inspecting the leak and maintaining the brake pressure. The master brake cylinder is the first element of the hydraulic system where it creates brake pressure and transmits the brake fluid thrust to the brake units on the vehicle wheels. When the brake pedal sinks, the lower brake fluid level in the

reservoir, the brake warning lamp illuminates, or the brake pedal reserve height is too low, check the master cylinder for external and internal leaks.

The external leak test includes an inspection of the brake fluid levels in the reservoir and a visual inspection of the brake cylinder for obvious signs of leakage. Then check all brake line fittings on the brake cylinder, sensor connections, tank seals, and the rear of the master cylinder near a vacuum brake booster. Also, the inside of the vacuum hose on a vacuum brake booster is checked for the presence of brake fluid, which means that the brake fluid passes next to the primary piston in the master brake cylinder and the front seal of a vacuum brake booster.



After a visual inspection of the external leak, check that the brake pressure is maintained. Start the engine and gently pressed the brake pedal. The pedal should hold the same position without falling for at least 1 minute. If the pedal sink, it is a sign that there is an external or internal leak in the hydraulic brake system and requires a further testing system.

If the brake pedal sink during the stable position test and the brake pedal pressure is tested, check the master cylinder for internal leakage. Remove the tank cap and observe the brake fluid level. When the brake pedal is depressed and released, a change in level should occur. However, if the brake fluid level rises when the pedal is depressed, the master cylinder may have an internal leak.

We check the existence of an internal leak using the blocked cylinder method. The brake hoses are removed from the cylinder. Bleeding the master brake cylinder and locks (plugs) are installed on the cylinder connections of the removed hoses. Slowly depress the brake pedal and hold it firmly. Check that there are no leaks on the blocked plugs. If the brake pedal sink, there is an internal leak in the master cylinder.

To testing the master cylinder, follow these steps:

1. Checking the external leak: Check the brake fluid level in the reservoir. Visually inspect the master cylinder for leaks: brake line connections, sensors, tank seals, and rear to a vacuum brake booster. Check the inside of the vacuum hose for brake fluid.

2. Checking the maintenance of brake pressure: Start the engine, depress the brake pedal, and keep it depressed for 1 minute. If the pedal sink, there is an external or internal leak in the hydraulic brake system.

3. Checking the internal leakage: Depress the brake pedal and observe the brake fluid level in the reservoir. If the brake fluid level rises, there is a possibility that the master cylinder has an internal leak.

4. Checking by the method of blocking: Remove all brake hoses from the master cylinder. Bleeding from the cylinder and insert the plugs in the places of the removed hoses. Depress the brake pedal and hold firmly. Check for fluid leaks on the plugs. If the brake pedal sink, there is an internal leak in the master cylinder.

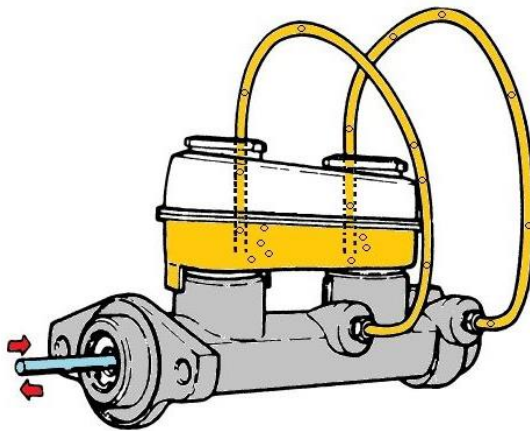
Text 27. Bench Bleeding a Master Cylinder

Source: <https://autoedu.info/en/auto-mechanic/brakes/hydraulic-braking-system/bench-bleeding-master-cylinder/>

After removal, repair, or replacement of the main brake cylinder performs bleeding of a brake master cylinder on the workbench. Bench bleeding makes removing air from the hydraulic system easier when the master cylinder is installed in place. Otherwise, the air in the cylinder reaches the hydraulic system directly, preventing pressure from being created and making it difficult to bleeding.

First, the old brake fluid is removed from the tank. Then all brake lines and the nut that connects the master brake cylinder and a vacuum brake booster are removed. The master cylinder pushrod length is measured.

The master brake cylinder is removed and mounted on a vise so that the paws cover the cylinder lugs. Install the bleeder lines into the master cylinder outlet ports with the ends of the lines deep within the master cylinder reservoir. Fill the tank halfway with clean brake fluid.



Bench bleeding a master cylinder

Using a suitable tool, gently push the piston into the brake cylinder. The pressure created inside the cylinder should push air and old brake fluid through the hoses into the tank. Release the piston to return to the starting position. Repeat the procedure until all air bubbles are removed from the master cylinder.

After bleeding the master brake cylinder on the workbench, we mount the master brake cylinder on the vacuum brake booster and fasten it with screws. Remove the hoses from the cylinder and connect the brake lines. We add brake fluid to the tank. The master cylinder is now ready for operation on the brake system.

To bench bleed a master cylinder, follow these steps:

1. Removal from the vehicle: Remove the old brake fluid from the reservoir. Remove all brake lines from the cylinder. Unscrew the nut that connects the cylinder and the vacuum brake booster. Remove the cylinder from the vehicle. Measure the master cylinder pushrod length.

2. Preparation for bleeding: Remove the removed cylinder to the vise. Connect the air extraction hoses to the hydraulic connections of the brake cylinder. Insert the other end of the hose into the tank. Fill the tank halfway with clean/new brake fluid.

3. Bleeding: Gently depress and release the brake cylinder piston and observe the brake fluid passing through the bleeding hoses from the cylinder into the reservoir. Repeat the procedure until the air bubbles are removed from the brake fluid.

4. Installation on the vehicle: Connect the master brake cylinder to the vacuum brake booster and secure it with nuts. Remove all air extraction hoses and connect the brake lines to the brake cylinder. Top up the brake fluid in the reservoir to the appropriate level.

Text 28. Adjusting Master Cylinder Pushrod Length

Source: <https://autoedu.info/en/auto-mechanic/brakes/hydraulic-braking-system/adjusting-master-cylinder-pushrod-length/>

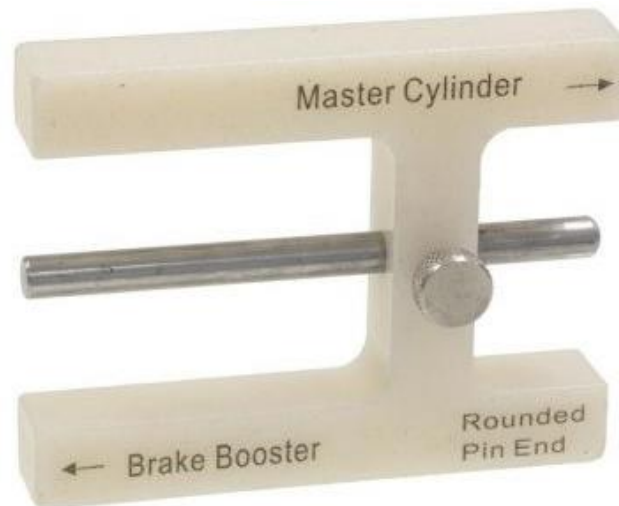
Adjusting the pushrod length of the vacuum brake booster is the process of adjusting the movement of the piston in the master brake cylinder. The piston lever is the connection between the brake pedal and the piston of the master cylinder. The length of the lever determines the correctness of the brake system, the correct position of the pedal, and the correct operation of the master brake cylinder.

The length of the thrust lever defines the movement of the piston in the master brake cylinder. If the length is too long, the lever prevents the piston from returning to the starting position after braking, which prevents the brake pressure from being completely lowered and the brake from returning to the starting position. When the length of the lever is too short, we have too much free play in the brake pedal and may occur noise from the vacuum brake booster.

Master cylinder pushrod length is defined for each vehicle. We perform the adjustment only when we determine that someone before us has adjusted the length, after repairing, adjusting the brake pedal, or replacing the vacuum brake booster. Replacing the master cylinder does not require adjusting the pushrod length.

Adjusting pushrod length is done with a special tool. The tool consists of spacers on both sides and a movable measuring rod in the middle. It is first mounted on the master brake cylinder at the part where the pushrod enters. Release the rod screw and gently push it to touch the cylinder piston. This position of the rod is fixed with a screw.

Then the other arm of the measuring tool is placed on the vacuum brake booster towards the pushrod. If the tip of the pushrod does not touch the measuring rod, it is necessary to adjust the length of the pushrod. Unscrew the lock nut and place the push lever in position to touch the dipstick. The adjusted position of the pushrod is ensured by turning the lock nut.



Measuring tool for adjusting pushrod length

In the absence of a special tool, a caliper can be used to adjust the length of the pushrod.

To adjusting the master cylinder pushrod length, follow these steps:

1. Removing the master cylinder: Remove the master cylinder from the vacuum brake booster. Check that the brake pedal to the starting position.
2. Adjusting pushrod length: Measure the length of the pushrod on the master brake cylinder with a suitable measuring tool. Place the measuring tool on the vacuum brake

booster. Unscrew the lock lever lock nut. Adjust the lever to the required length. Tighten the lock nut and recheck the length of the pushrod.

3. Installing the master cylinder: Return the master cylinder to the vacuum brake booster. Check the movement of the pushrod and piston.

Text 29. Checking the Vacuum Brake Booster

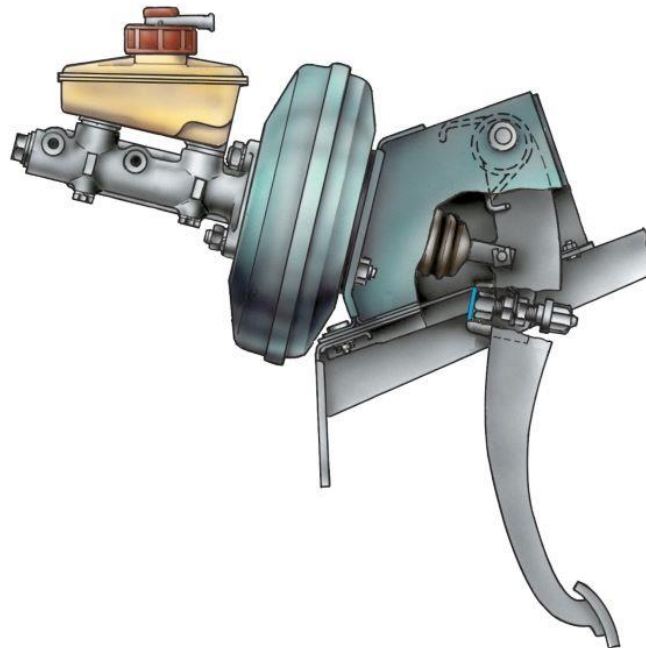
Source: <https://autoedu.info/en/auto-mechanic/brakes/hydraulic-braking-system/checking-vacuum-brake-booster/>

Checking the servo device is performed in two parts: checking the free play of the pedal and testing the correctness of the vacuum brake booster.

A power booster is a vacuum brake booster. When not working, the driver has a high resistance when pressing the brake pedal which is reflected in the reaction speed and braking safety.

Proper free play of the pedal ensures that the piston of the master brake cylinder returns to the end and opens the compensating lines for the return of brake fluid. Insufficient free play can prevent the piston from fully returning and the brake pressure in the wheel brake units from being released completely. Excessive free play is not good either, as it reduces the reserve height of the pedal in the event of a hydraulic system leak.

The free play position of the pedal is secured and there is usually no need to adjust. There are situations when it is necessary to adjust the free play of the pedal: someone has changed the adjustment, repair, or adjustment of the brake pedal, and the pushrod has worn out over time, which leads to increased free travel, or the power booster is changed. Changing the master cylinder alone does not usually require adjusting the free play of the brake pedal, but it is desirable to verify that it is within specifications.



Measure the height of the brake pedal to the floor of the vehicle. Gently press the pedal with your hand until resistance appears and measure the height. The free play of the pedals is the difference between the previous two measured values. If the measured value is not according to the specifications for the given vehicle, proceed to the free play setting.

The second part of the check is direct testing of the power booster. Preparation for the test is performed with the engine switched off. Depress the brake pedal five or six times to remove all vacuum from the power booster. Then depress moderately and hold

the brake pedal. While holding down the brake, the engine starts, and if the pedal sinks 2 to 5 cm the power booster works well. If the pedal does not sink after starting the engine, the power booster does not have its function to increase the braking force and it is necessary to perform additional tests to discover the cause of the fault.

Also, if the engine malfunctions after starting the engine while holding down the brake pedal, and stabilizes its operation when the pedal is released, this may indicate a vacuum leak in the power booster. Then check the external and internal vacuum leaks to detect a fault.

To checking the vacuum brake booster, follow these steps:

1. Brake pedal free play check: Measure the height of the pedal. With a light pressure of the hand, push the brake pedal to the position when strong resistance is felt and measure the new height. Calculate the free play of the pedal and compare it with the specifications. If the data do not agree, specify all necessary actions.

2. Vacuum brake booster testing: With the engine switched off, depress and release the brake pedal five to six times. Press and hold the pedal. Start the engine. The pedal should sink 2-5 cm. If this is not the case, perform additional tests to detect the fault.

Text 30. Checking Vacuum Supply to the Power Booster

Source: <https://autoedu.info/en/auto-mechanic/brakes/hydraulic-braking-system/checking-vacuum-supply/>

The power brake booster must have the right amount of vacuum to work properly. With insufficient vacuum, the driver must step up the pressure force on the foot pedal to activate the brake. Excessive vacuum is not a problem because the servo device is dimensioned to work with the maximum vacuum that the motor can create. Gasoline engines create a vacuum in the intake manifold in idle mode. Diesel engines use a special engine-driven vacuum pump or a built-in intake manifold throttle valve that is activated when the power booster needs a vacuum.

The minimum required vacuum for proper operation of the power brake booster is 0.54 bar.

Engines having a system for camshaft adjustment in some cases have a lower vacuum and be harder to press the brake pedal. Vehicle manufacturers solve this problem by installing a power sensor vacuum sensor so that the electronic system regulates the operation of the camshaft control system when it is necessary to create the required vacuum or install an additional vacuum pump. Also, operating the engine at higher altitudes results in a lower vacuum. At every 300 m above sea level, the vacuum is reduced by 33 mbar.

The test is performed by disconnecting the vacuum hose from the power booster when the engine is switched off. A manometer for measuring the vacuum is installed on the free end of the hose. Start the engine and in idle mode complains vacuum value. The vacuum should have a value below 0.54 bar. If the pressure is higher, the cause of the weaker vacuum is found.

To checking the vacuum supply to the power booster, follow these steps:

1. Preparation for measurement: When the engine is off, disconnect the vacuum hose from the servo. Connect a vacuum gauge to the end of the vacuum hose.

2. Vacuum measurement: Start the engine. Read the magnitude of the vacuum when the engine is idling. Compare the obtained result with the required values from the information system for a given vehicle (when not specified, the expected upper value of vacuum is 0.54 bar).

3. Analysis and completion of measurements: If the vacuum value is insufficient, check for vacuum leaks, supply hose restrictions, or engine malfunction. After measuring, remove the manometer and connect the vacuum hose to the servo device.

Text 31. Checking Vacuum Leaks from the Power Booster

Source: <https://autoedu.info/en/auto-mechanic/brakes/hydraulic-braking-system/checking-vacuum-leaks/>

When it is determined that the engine provides the necessary vacuum for the operation of the power booster and the brake pedal is still hard, i.e., the driver must apply a higher force of foot pressure when braking, the vacuum leak from the power booster is checked. Vacuum leaks can affect the formation of the fuel/air mixture and the operation of the engine. The vacuum leak on the power booster can be external or internal.

First, check for external vacuum leaks. The engine is started and left to run for at least 10 seconds. The engine shuts off without depressing the brake pedal. After 10 minutes, depress the brake pedal (moderately firm pressure), paying attention to the free play and reserve travel. Then, with the same force, press the brake pedal a few more times. Each new pressure releases a vacuum from the power booster, which results in a firmer brake pedal. This behavior of the brake pedal is a sign that there is no external vacuum leak. If the pedal behaves differently then you need to check the power booster to the external vacuum leaks.

The places where external vacuum leakage can occur are rubber plug or valve for measuring the vacuum on the power booster, front or rear seals, the atmospheric valve on the back of the power booster, on the joints of the two halves of the power booster housing, or holes on the housing itself.

Checking for internal vacuum leaks begins by starting the engine and let it run at idle. Then depress the brake pedal with firm pressure. Without moving the foot from the pedal, the engine is turned off and the behavior of the brake pedal is observed for about 1 minute. If the position of the pedal remains stable, there is no internal leakage. However, if the pedal is raised there is an internal leak in the diaphragm, control valve, or non-return valve.

To checking vacuum leaks from the power booster, follow these steps:

1. Checking the external vacuum leaks: Start the engine and switch it off after 10 s. After 10 minutes of standstill, depress and release the brake pedal several times. With each new press, the pedal should be firmer. If the pedal behaves differently, there is a leak and should be taken further testing.

2. Checking the internal vacuum leaks: Start the engine and let it idle for 10 minutes. Depress the brake pedal firmly and switch off the engine without releasing it. Maintain foot pressure and observe pedal behavior for 1 minute. If the position is maintained, there are no leaks. If the pedal is raised, there is internal leakage and the need to take further tests.

Text 32. Testing the Vacuum Check Valve

Source: <https://autoedu.info/en/auto-mechanic/brakes/hydraulic-braking-system/testing-vacuum-check-valve/>

When there is an internal vacuum leak from the power booster, one of the possible causes is a malfunction of the vacuum check valve. The power booster receives vacuum from external sources such as the engine intake line or vacuum pump. The vacuum is delivered to the power booster by a vacuum line.

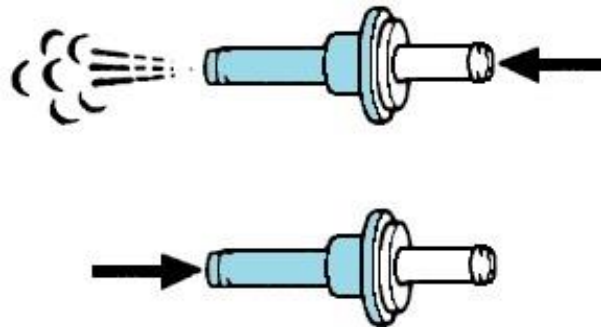
The power booster should preserve the obtained vacuum until the first braking. However, the delivered vacuum can be lost through the same vacuum line in the opposite direction when the vacuum source has a higher pressure or when it is not working. That is why there is a vacuum check valve between the vacuum source and the servo device. The

vacuum check valve passes the vacuum only in the direction from the source to the servo device. Blocks the opposite movement of the vacuum of power booster to the source.

A faulty vacuum check valve does not hold the vacuum and leaks it from the servo device, which results in a harder brake pedal and difficult braking. Testing is performed in two steps.

The engine is started for 30 seconds to fill the power booster with a vacuum. Wait 10 minutes after turning off the engine and remove the check valve from the power booster. After removing the valve there should be a strong rush of air into the power booster, which is a sign that the check valve is holding a vacuum.

However, if there is no air surge after the removal of a check valve, a vacuum leaks from the power booster. A faulty check valve can cause a loss of vacuum. We remove the check valve and let air in or create a vacuum at both ends of the valve. The correct check valve should leak in one direction and block the movement of air in the other. If the check valve leaks air in both directions, should be replaced with a new one.



Testing the vacuum check valve

To testing the vacuum check valve, follow these steps:

1. Vacuum holding check: Start the engine and switch it off after 30 s. After 10 min, remove the check valve from the power booster. If a strong rush of air into the power booster occurs after removing the check valve, there is no vacuum leak. If there is no air surge, there is a vacuum leak and a valve check is approached.

2. Testing the vacuum check valve: Remove the check valve. Let air through both ends of the valve. If the valve leaks air in only one direction, then it is correct. If it leaks air in both directions then it is defective and replaces with a new valve.

Test 33. Inspecting Brake Lines and Hoses

Source: <https://autoedu.info/en/auto-mechanic/brakes/hydraulic-braking-system/inspecting-brake-lines-and-hoses/>

All vehicle manufacturers recommend inspecting the condition of the brake lines and hoses. Regular inspection can show where brake line maintenance is required to prevent brake system failures.

The inspection covers the condition of steel and reinforced lines, joints, couplings, and supports. The brake lines are inspected from the master cylinder to the brake units on the vehicle wheels.

Steel brake lines are inspected for brake fluid leaks, dents, twists, bends, rust, and cracks.

Flexible rubber-reinforced brake hoses are inspected for appearance, brake fluid leaks, cracks, fissures, chap surfaces, bulges, wear, twisting, and crushing.

Couplings and supports are checked. It is necessary to tighten the loose couplings and return the dropped lines to the appropriate position.

To inspecting brake lines and hoses, follow these steps:

1. Vehicle preparation: Safely raise the vehicle with a hoist to the required height.
2. Brake line inspection: Inspect all brake lines from the master cylinder to the wheel brake units. Record any detected irregularities and replace damaged brake lines.
3. Inspection of couplings and supports: Inspect and tighten loose brake line couplings and supports.

Text 34. Checking Disc Brake Rotors

Sources: <https://autoedu.info/en/auto-mechanic/brakes/disk-brake/>,
<https://autoedu.info/en/auto-mechanic/brakes/disk-brake/checking-disc-brake-rotors/>

The disc brake is a very effective element for the safe and fast stopping of the vehicle. Only a correct system can provide the driver's requirements for safe braking while driving. Therefore, it is necessary to regularly check the correctness and replace the consumable elements of the disc brake. If there is any doubt about the correctness, a detailed inspection, testing, and replacement of defective components are performed without delay.

Drivers often complain that the vehicle has poor stopping, skidding, noise, vibration, pulsation, or brake pedal failure when braking. This is a signal to check the disc brakes. Checking the correctness, inspection, maintenance, and repair of disc brakes is performed by an expert in compliance with the manufacturer's recommendations, knowledge of the operating procedure, proper selection of parts, and the use of appropriate tools. The safety of vehicles, passengers, and other traffic participants depends on their work.

Checking the brake rotor involves visually inspecting the condition and measuring the thickness and lateral runout of the brake rotor. For proper brake disc operation and safe braking of the vehicle, all values must be within specifications.

Before inspection and measurement, it is necessary to get acquainted with the specifications and limit values for a given brake rotor.

Visual inspection to check whether there are stains (cold or hot), fissures, cracks, and damage to the rotor surface. Any defect in the brake rotor affects the quality of braking and additional wear on the brake pads. Based on the size of the damage, a decision is made to replace the brake rotor.

After visual inspection, the thickness of the brake rotor is measured. Thinner brake rotors cannot accept the heat of friction generated during braking. Therefore, the braking is weaker. Also, the variation in the thickness of the brake rotor during braking leads to the pulsation of the brake pedal and the shaking of the vehicle.



The thickness of the brake rotor is measured with a micrometer with a deeper frame, a movable gauge (caliper) with protruding calipers, or a special disc thickness gauge. The measurement is performed in 5 to 8 places. The minimum measured rotor thickness must not be less than specified in the specification. If the measured varying thickness on the brake rotor, the difference between the largest and smallest measured thickness should not be greater than the value of the variations given in the specification.

If the thickness and variations of the brake rotor are outside the specified values, the brake rotor must be replaced.

Finally, the flatness of the rotor surface is checked. Excessive lateral unbalanced rotation can cause the brake pad to touch, causing the steering wheel to vibrate, brake with the brake pedal released, scratching and whining while driving, heating the brake rotor and pad, uneven pads, and rotor wear. The measurement is performed with a comparator on the outer surface of the brake rotor.

To check disc brake rotors, follow these steps:

1. Preparing to check: Read the required values from the information system, which are checked on the brake rotor (thickness, thickness variation, allowable irregularities). Raise the vehicle to the appropriate height, remove the wheels and pads from the brake disc. If necessary, clean the surface of the brake rotor.

2. Visual inspection of the brake rotor: Check the condition of the brake rotor for stains, cracks, and damage by manual and visual inspection. Assess the condition and degree of brake rotor damage. If it is necessary to replace the damaged rotor.

3. Brake rotor thickness check: Use a thickness gauge to measure five to eight places around the entire circumference of the brake rotor. Record the measurement results and compare them with the required values for the minimum thickness and the maximum variation of the rotor thickness. If the values are not within the specified range, replace the brake rotor.

4. Measuring lateral runout: Place the comparator on the shock absorber housing or the wheel hub. Adjust the comparator so that the tip of the measuring needle rests on the surface of the brake rotor. Manually rotate the rotor and read the minimum and maximum value on the comparator. The difference between these two values represents the size of the largest lateral runout on the brake rotor. If the lateral runout is greater than allowed, assess whether machining or brake rotor replacement is required.

Text 35. Replacing Disc Brake Rotors

Source: <https://autoedu.info/en/auto-mechanic/brakes/disk-brake/replacing-disk-brake-rotors/>

Replacing disc brake rotors is performed when it is damaged, worn (insufficient thickness), or uneven. Also, the brake disc is removed due to surface machining, servicing of wheel bearings, or parts of the parking brake that is part of the brake disc.

Brake rotors last longer than the brake pads and usually last three to four pad changes. Brake rotors are changed in pairs, and when replacing rotors, brake pads are also changed.

Preparing to replace the brake disc involves purchasing new brake rotors (pair) and disc pads according to the specification of the vehicle.

The vehicle is mounted on a hoist, raise to the appropriate height, and the wheels removed.

The disc pads and calliper are removed first to release the brake disc for removal. First, remove the screw that secures the rotor to the wheel hub. Then remove the brake rotor from the wheel hub.

The installation is in reverse order, with new brake pads being installed at the end.

To replacing disc brake rotors, follow these steps:

1. Brake rotor removal: Follow the manufacturer's instructions for the rotor removal procedure. Place the vehicle on the hoist and remove the wheel. Remove pads and caliper. Remove the screw from the disc. Remove the disc from the wheel hub.

2. Brake rotor installation: Place the brake rotor on the wheel hub and center it relative to the screw hole. Fasten the rotor with a screw. Check that the brake rotor does not touch the protective plate or any other part during rotation. Install the caliper and the disc pads. Install the wheel.

Text 36. Steering Systems

Source: <https://autoedu.info/en/auto-mechanic/steering-systems/>

A steering system should ensure adequate quality of vehicle management. This function is crucial for driving safety and driver satisfaction. A good and high-quality vehicle control system reduces driver fatigue while driving.

Loose and worn parts of the steering system can cause incorrect steering, which causes the driver to turn the steering wheel continuously to keep the vehicle moving. A faulty steering system leads to premature driver fatigue. Also, when the power steering system is working, poor steering is difficult, which causes additional stress to the driver while driving.

If a component in the steering system fails and shuts down, the driver may lose control completely, leading to a vehicle collision and injury to the occupants.



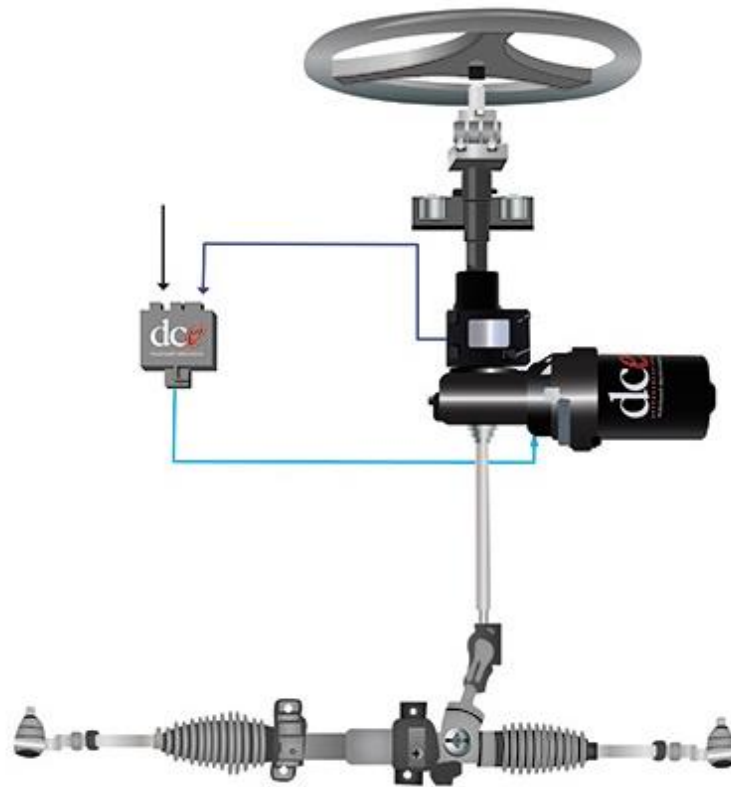
Mechanical steering system

Regular maintenance ensures a safe steering system. Also, any problems that arise must be diagnosed and fixed without delay. If the repair is not carried out in time or is performed incorrectly, there may be a loss of control over the vehicle and an accident. Therefore, follow the instructions from the vehicle manufacturer regarding regular inspection and repair of the steering system.

Steering systems are mostly mechanical, so visual inspections and physical measurements make up a good portion of maintenance and diagnosis tasks. Mechanical components wear out over time, reduce their functionality and eventually fail. But as more and

more electronic power steering is introduced, electrical failures are becoming more common. The sensors are also subject to wear, resulting in inaccurate readings and incorrect reactions. Wires are subject to damage, breaks and loose or corroded connections.

When a problem occurs in the control system and performs diagnostics, it is important to consider both the mechanical and electrical components. Also, since the suspension system is directly connected to the steering system and helps keep the wheels in proper geometry, any suspension problems can affect the steering system. Thus, sometimes the cause of the steering problem may be due to some component in the suspension system.



Electronic steering system

When working on the steering system, be careful and pay attention to the following:

- Pay attention to rotating parts and belts while the engine is running.
- The power steering fluid can be hot during operation. Take precautions to avoid burns.
- Power steering systems can reach operating pressures of over 100 bar during operation. Always follow the vehicle or equipment manufacturer's instructions when working on the system.
- The power steering fluid is flammable. Always keep it away from hot exhaust manifolds, pipes, or catalysts.
- The power steering fluid is aggressive and cleans up spills immediately.
- Wear suitable chemical-resistant gloves when working on hot systems.

Text 37. Diagnosis Based on Customer Concerns

Source: <https://autoedu.info/en/auto-mechanic/steering-systems/diagnosis-based-on-customer-concerns/>

Based on the client's complaint about poor vehicle handling, diagnostics of the steering system and detection of the cause of the malfunction are performed. Steering systems can create several different customer concerns. The steering issues can be due to the

existence of play, unusual noise, vibrations, drifting, stiff steering, vibration, or shimmy of the vehicle. The most common culprits are wear, poor lubrication, or damaged control and suspension system parts.

When problems arise with vehicle steering, it is necessary to check the entire steering system to identify all malfunctions thoroughly. The best way to prevent the steering system is to inspect each component, review or measure play, look for bent or damaged clamps, and test the operation of the power steering system.

They are often customer concerns about driving caused by problems in the steering system, and sometimes in the suspension system. A good diagnosis finds the exact cause of the customer's concerns. Clients can describe the problem in different ways. Client complaints and their typical causes are discussed.

The common customer's concerns are:

1. Excessive steering wheel play: Excessive play is evident when the steering wheel moves too much before the wheels start to turn. A little free play is normal.

The causes of this problem can be:

- Loose, worn, or damaged steering linkage or tie-rod ends.
- Loose ball joints.
- Loose, worn, or damaged steering column U-joints.
- Loose, worn, or damaged steering column bearings.
- Damaged or worn steering gear.
- Air in the power steering hydraulic system.
- Loose steering gear bolts.
- Defective strut bearing or plate.

2. Feedback: When the driver senses the road surface through the steering wheel, it is the feedback of the steering system.

This problem may be due to:

- Loose, worn, or damaged steering linkages or tie-rod ends.
- Loose, worn, or damaged column U-joints.
- Loose or damaged steering gear bolts.
- Damaged or worn steering column bearings.
- Loose bushings, fasteners, or ball joints.

3. Hard steering: When extra effort is required to turn the steering wheel, drivers complain of stiff steering. This problem most often occurs when the servo system is faulty. Problems with the hard steering wheel can also occur when the steering wheel is turned almost all the way.

This problem may be due to:

- Defective power steering pump.
- Damaged or defective steering column bearings.
- Trapped steering column U-joints.
- The control gear is tight.
- Defective suspension components.
- Stuck flow control valve.
- Inadequately inflated tires.
- Limited power steering or hose lines.

4. Nibble: Nibble is the result of the interaction of the tires with the road surface. A customer complaint can describe the nibble problem as slight rotational oscillations of the steering wheel.

This problem may be due to:

- Loose, worn, or damaged steering linkage or tie-rod ends.

- Loose, worn, or damaged suspension parts.

5. Drift: Pulling is the feeling of drift on the steering wheel. The driver must push the steering wheel in the opposite direction from the pull to keep the vehicle straight. Drifting is a condition in which the vehicle slowly moves to one side of the road when the driver takes his hands off the steering wheel.

This problem may be due to:

- Improper body alignment.
- Brake system problem.
- Worn or broken suspension components, especially springs.
- Poor wheel alignment.
- Unevenly loaded or overloaded vehicle.
- Loose, worn, or damaged steering linkage or tie-rod ends.
- Unbalanced steering gear.
- Tire problems.
- Binding strut bearing.
- Loose shock absorber cup.

6. Shimmy: When the wheels shimmy, the driver will feel large, constant rotational oscillations on the steering wheel. These movements are caused by lateral bending of the tires.

This problem may be due to:

- Loose, worn, or damaged steering linkage or tie-rod ends.
- Loose, worn, or damaged parts of the suspension.
- Unbalanced tires.
- Excessive wheel runout.
- Bad tire.
- Loose wheel bearings.

7. Sticking steering and poor return: Poor returnability and sticky steering are the resistance of the steering wheel to return to the center after turning.

This problem may be due to:

- Binding steering U-joints.
- Loose, worn, or damaged steering linkage or tie-rod ends.
- The steering gear set is too tight.
- Loose, damaged, or worn suspension parts.
- Poor wheel alignment.
- Worn steering column bearings.

8. Wandering: When the vehicle wanders, the driver must constantly turn the steering wheel left and right for the vehicle to go straight on a level road.

This problem may be due to:

- Loose or worn suspension components.
- Poor wheel alignment.
- An unevenly loaded or overloaded vehicle.
- Loose or damaged steering gear bolts.
- Loosened steering column U-joint bolts.
- Loose, worn, or damaged steering linkage or tie-rod ends.
- Incorrectly steering gear preload adjustment.
- Leaking rack pistons.

Text 38. Noise-based Diagnosis

Source: <https://autoedu.info/en/auto-mechanic/steering-systems/noise-based-diagnosis/>

When customers complain of abnormal noise or vibration coming from the steering system, diagnostics are performed based on that noise. Often this diagnosis must be made during a test-driving, driving under conditions similar to the owner's usual driving. Since there is already a suspicion of a problem with driving, be sure to drive carefully and cautiously. Before testing on the road, thoroughly inspect the safety of vehicles, including tires. When a problem is identified during the test-driving, use the symptoms (pronounced noise) to identify a possible area of failure. Then check the parts in that area.

To determine the cause of the noise, redirect attention to where the noise is coming from. Some unusual sounds can cause tires or noise between the steering wheel and the steering column covers. Others may result from a faulty power steering pump or steering system. There can be many reasons for this, and some of them are outside the steering system.

The following are symptoms such as unusual noise that occurs during driving and possible causes of such noise:

1. Chirping or squeaking drive belt as the steering wheel moves from stop to stop. This problem may be due to:
 - Loose or worn drive belt.
2. Noise during cold start. This problem may be due to:
 - Blockage in the power steering fluid reservoir.
 - Air in the hydraulic steering system.
3. The steering grunts, growls, or shudders when turning or returning to the starting position at low speeds. This problem may be due to:
 - Air in the hydraulic steering system.
 - Pinched hose of hydraulic system.
4. Steering system clunk. This problem may be due to:
 - Air in the hydraulic system.
 - U-joints.
 - Steering gear.
5. Steering gear squeak. This problem may be due to:
 - Improper servo oil in the system.
 - Steering gear rotary seal.
 - Steering column components.
6. Power steering hissing or whistling. This problem may be due to:
 - Steering column shaft binding or misaligned.
 - Damaged or worn steering gear input shaft and valve.
 - Low oil pressure from the power steering pump.
 - Restricted power steering lines.
7. The power steering pump moans when the steering wheel is turned to the stop position. This problem may be due to:
 - Low oil level.
 - Air in the hydraulic system.
 - Steering oil reservoir blocked or damaged.
 - Power steering pump bracket loose or damaged.
 - Poor steering gear insulators.
8. Power steering pump whine. This problem may be due to:
 - Air bubbles in the oil.
 - Damaged power steering pump.

9. Rattle, chuckle, knock or scrape is felt in the steering wheel when the vehicle is moving on a rough road. This problem may be due to:

- Steering column shaft/coupling joints are worn or damaged.
- Loose, worn or damaged tie-rod ends.
- Loose or damaged steering gear insulators or mounting bolts.
- Loose mounting bolts on the steering column/transmission shaft.
- Worn or damaged steering column.
- Loose suspension bushings, bolts, or ball joints.

10. Steering column rattle. This problem may be due to:

- Loose bolts or mounting brackets.
- Loose, worn, or insufficiently lubricated column bearings.
- Worn or damaged steering shaft insulators.
- The steering column shaft/coupling is compressed or extended.

11. Steering column squeak, grinds, or cracks. This problem may be due to:

- Poorly lubricated steering shaft bushings.
- Loose or misaligned steering column covers.
- Touch steering wheel on steering column cover.
- Upper or lower bearing sleeves out of position.

Text 39. Diagnosing Power Steering Fluid Leakage

Sources: <https://autoedu.info/en/auto-mechanic/steering-systems/power-steering-fluid-check/>, <https://autoedu.info/en/auto-mechanic/steering-systems/diagnosing-power-steering-fluid-leakage/>

Power steering fluid was checked regularly and the reservoir topped up if necessary. Too little or contaminated and old power steering fluid leads to irregular operation of the steering system. Before checking the power steering fluid level, it is necessary to find out from the manual for that vehicle whether the measurement is performed when the engine is cold or warmed up. The reservoir cap contains a dipstick with min and max markings. Often there are markings for cold and hot measurements on the dipstick. It is more accurate to measure the level when the engine is warmed up, i.e., when the power steering fluid is warm.

Be careful when working with power steering fluid as it is a highly flammable liquid. When power steering fluid gets on hot parts of the engine or exhaust system it can cause a fire.

Diagnosing power steering fluid leakage is performed when the oil level is lower than the prescribed minimum value during the check. When we have a lower fluid level in the reservoir, in addition to topping up, it is necessary to determine the cause of the loss of power steering fluid. The most common drop in fluid level is due to a leak.

When the power steering fluid level is lower than the minimum value, there is a risk of air entering the hydraulic part of the steering system. Air has a bad effect on the operation of the steering system, there is difficulty in starting the steering wheel and the possibility of serious malfunctions in some components of the servo system. Also, power steering fluid is highly flammable and if it gets on a hot engine or an exhaust system it can cause a fire. That is why it is necessary to discover and eliminate the cause of fluid loss and perform the procedure of bleeding the steering system

When a power steering fluid leak is suspected, with the ignition off, wipe the exterior of the power steering pump, reservoir, pressure hose, return hose, radiator, and steering gear. Then the engine is started and the steering wheel is turned to one side and the other several

times. The engine is turned off and diagnosing power steering fluid leakage. It may be necessary to re-check for leaks after a period of driving. While diagnosing a power steering fluid leak, look at the hoses for signs of bloat. Always replace power steering hoses with the correct replacement hose. Never attempt to repair or seal a leak at a hose or fittings.

Another method uses standard fluorescent dyes. Following the instructions, the appropriate amount of paint is added to the reservoir of the power steering fluid. After the recommended driving time, all servo system components are inspected with an ultraviolet lamp, which will illuminate the fluorescent paint and make it easier to spot leaks.

To diagnose a power steering fluid leak, follow these steps:

1. Cleaning the steering system: Clean the exterior of the steering pump and the power steering fluid reservoir, then all the hoses and their connections. Finally, clean the hydraulic distributor of the steering wheel. Use suitable degreasing and cleaning agents for very dirty places.

2. Preparing the steering system for testing: Start the engine and turn the steering wheel several times to one side and the other all the way. If necessary, let the vehicle drive for several days before inspecting the power steering system for leaks.

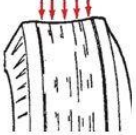
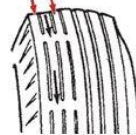
3. Diagnosing power steering fluid leakage: Inspect in detail all elements of the steering system for leaks (steering pump, reservoir, pressure hoses, return hoses, radiator, and hydraulic steering distributor). If you notice that any hose is damaged or swollen, replace it with a new suitable hose.

4. Diagnosis of leaks with a UV lamp: If no fluid leakage is detected and it is still suspected that this is the cause of fluid loss, perform an inspection with a UV lamp. Pour the appropriate amount of fluorescent dye into the steering fluid reservoir. After the recommended driving period, inspect the power steering system with a UV lamp.

Text 40. Steering System Visual Inspection

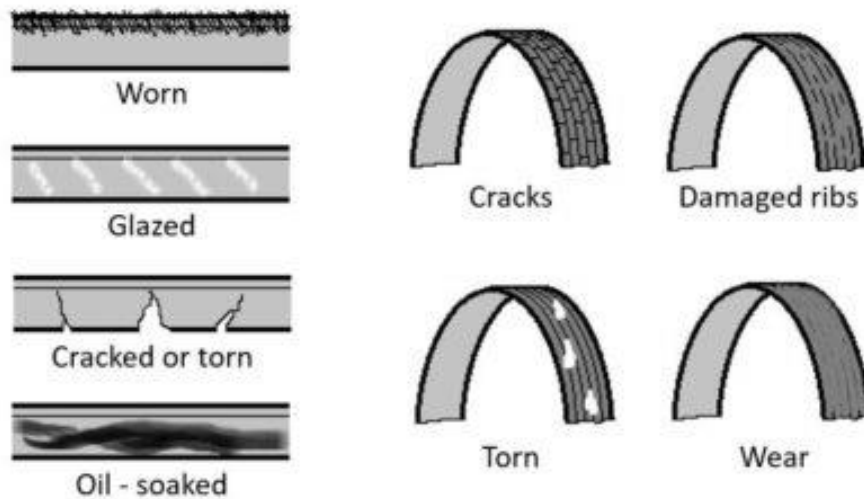
Source: <https://autoedu.info/en/auto-mechanic/steering-systems/steering-system-visual-inspection/>

A visual inspection of the steering system begins with a tire inspection. Check for correct pressure, construction, size, wear, and damage, as well as defects that include ply separation and sidewall knots. You should know that tire wear patterns are good indicators of problems with driving and hanging vehicles. Tire wear is also a great indicator that there is a problem with the alignment of the wheels.

Condition	Wear at shoulders	Wear at center	Wear on one side	Feathered edge	Bald spots	Scalloped wear	Cracked treads
Effect							
Cause	- Low tire pressure - Worn shock absorber - High speed in corners - Lack of rotation	- High tire pressure - Poor wheel geometry - High wheel speed - Lack of rotation	- Poor wheel geometry - Slope point too large - Defective strut bearing - Damaged lower arm	- Poor wheel geometry - Worn or damaged tie rods - Damaged wheel-hub or wheel-hub joint	- The tire is not balanced - Large radial wheel play - Worn shock absorbers	- Poor wheel geometry - Slope point too large - Worn or damaged suspension elements	- Wheel rotation speed too low or too high

Tire wear patterns

After inspecting the tires, the condition inspection of the power steering drive belt, if equipped, is performed. The proper operation of the pump depends on the condition and tightness of the belt. The loose belt creates low pump pressure and difficult operation. A loose, dry, or worn belt can cause squeaking, especially during engine acceleration and cornering. The power steering drive belt is checked for tension, cracks, oil absorption, wear or smoothing of the edges, and tearing. If there is any irregularity, the belt should be replaced and adjusted properly.



Drive belt condition

Also, the level and quality of the servo oil are checked. The oil is checked at the servo pump reservoir using a dipstick attached to the reservoir cap. Before checking, find out whether the measurement is taken when the oil is cold or warm, or whether there are markings for both conditions. If it is checked when warm, let the engine idle for 2 or 3 minutes and turn the steering wheel from end to end several times. This warms the fluid to normal operating temperature and gives a more accurate reading.

Carefully examine the condition of the liquid. Check for evidence of contamination such as solid particles or water. If any of these conditions are present or the fluid has an unpleasant odor, flush the system.

Also, check if there is any air trapped in the fluid in the system. If the oil seems foamy, there is likely air in the system. To confirm this, run the engine until it reaches the normal operating temperature. Then turn the steering wheel to the left and to the right several times without rolling all the way. If there is air in the system, bubbles will appear in the power oil reservoir. Bleeding the system will remove the air.

With the ignition off, wipe the exterior of the power steering pump, pressure hose, return hose, fluid cooler, and steering gear. Start the engine and turn the steering wheel several times from end to end for the pump to create oil pressure. Check for leaks. Fluid leaks will cause strange noises and may result in uneven and strained steering. If there are no signs of leakage at first, repeat the test several times. While doing this, look at the intestines for signs of bloating. Always replace power steering hoses with the correct replacement hose. Never attempt to repair or seal a leak at a hose or fittings.

Carefully check all mechanical parts of the steering and suspension system. Many suspension problems can affect the operation of the steering system. Start from the steering wheel, through the transmission and rack to the end of the link. Make sure there are no loose, worn, or damaged steering system parts. It happens that problems with the steering system have a cause in the suspension system.

Text 41. Bleeding a Power Steering System

Source: <https://autoedu.info/en/auto-mechanic/steering-systems/bleeding-a-power-steering-system/>

When air enters the hydraulic part, it is necessary to bleed from the power steering system. Air enters the hydraulic section when the steering fluid level is below the minimum or when a part of the hydraulic steering system is removed for repair or replacement. The lack of fluid and the presence of air make it difficult for the servo system to work and thus the handling of the vehicle's steering wheel, which can lead to more damage to the elements of the power steering system.

Before bleeding, a new steering fluid is added to the reservoir up to the maximum. It is not recommended that the level of fluid in the reservoir is above the maximum. Then we hoist the vehicle or its front end with a jack so that the front wheels are above the ground. Without starting the engine, turn the steering wheel to one side and the other several times. We do this until the air stops coming out of the system into the steering fluid reservoir.

Then we start the engine. The level of steering fluid in the reservoir drops suddenly because the power steering pump pushes fluid into the system. Add new steering fluid to the maximum. While the engine is running, turn the steering wheel back and forth so that the steering fluid reaches every part of the hydraulic system, pushing the air out.

If there is still air left in the hydraulic system while driving the remaining part of the air should leave the steering system on its own. After a few days of driving, it is necessary to check the level of steering fluid in the reservoir and, if necessary, top it up to the maximum.

To bleed a power steering hydraulic system, follow these steps:

1. Preparation: Check the level of steering fluid in the reservoir and add new fluid to the maximum. Lift the vehicle or the front wheels off the ground with a hoist.
2. Bleeding without engine running: Without the engine running, the assistant turns the steering wheel left and right. While the steering wheel is turning, observe the fluid in the reservoir. The steering wheel rotates as long as air escapes from the system through the steering fluid in the reservoir. When there are no more bubbles in the reservoir, stop this procedure.
3. Bleeding while the engine is running: Recheck fluid level. Start the engine. If the fluid level drops, add a new power steering fluid to the maximum. While the helper turns the steering wheel again, observe the fuel in the reservoir. If the fluid no longer falls and there are no bubbles, stop this procedure. We lower the vehicle. After a few days of driving, recheck the power steering fluid level and top up to the maximum if necessary.

Text 42. Flushing a Power Steering System

Source: <https://autoedu.info/en/auto-mechanic/steering-systems/flushing-a-power-steering-system/>

Flushing a power steering system is the process of replacing the old steering fluid with a new one. This is done when the manufacturer specifies replacement dates when the fluid is contaminated or dirty or after mechanical problems with the steering pump or gear that can cause metal shavings to circulate through the hydraulic system.

When changing, use only the type of power steering fluid recommended by the vehicle manufacturer. A special device can be used to flush the steering system, which injects new fluid under pressure, displacing the old one without introducing air. Air introduced into the hydraulic part of the steering system can be detrimental to the steering pump. The steering pump is lubricated by steering fluid during operation. When the pump

is running dry, it can clog. If air gets into the hydraulic part, apply the procedure for bleeding from the steering system.

When you don't have a device to replace the steering fluid, you can perform the flushing manually by following the procedure described here. Always remember that power steering fluid is flammable, and if it gets on hot parts of the engine and exhaust system it can cause a fire.

As much old power steering fluid as possible is removed from the reservoir. Lift the vehicle or only the front part so that the front wheels do not touch the ground. Remove the return hose from the tank and insert it into a suitable container. Close the return line connection on the reservoir. Add new power steering fluid to the maximum.

Start the engine, and have an assistant turn the steering wheel from lock to lock. The level of steering fluid in the reservoir is monitored, with the new added continuously up to the maximum mark. When the fluid coming out of the return hose is clear, stop adding fluid, and keep running the engine until the level in the reservoir is just below the return line inlet. After that, turn off the engine.

The return hose is mounted on the reservoir and a new power steering fluid is added to the maximum. The engine starts again and turns the steering wheel from lock to lock to extract the air and fill the hydraulic part with fluid. After that, turn off the engine, and fluid is added. Lower the vehicle, start the engine, and turn the steering wheel from lock to lock to check that the system is working correctly with the vehicle weight on the tires. We dispose of waste steering fluid in an environmentally approved manner and place.

To flushing a power steering system, follow these steps:

1. Preparation: Remove as much power steering fluid as possible from the reservoir. Lift the front wheels off the ground with a jack. Remove the return hose and insert it into the conducting container. Check the return hose connection on the reservoir. Add new power steering fluid to the maximum.

2. Flushing: The assistant starts the engine and turns the steering wheel from lock to lock. Monitor the level in the reservoir and add fluid. Monitor the discharge of old fluid. When the new steering fluid starts coming out, wait for the level in the reservoir to drop below the connection for the return hose and stop the engine. Put the return hose back on the tank and add new fluid to the maximum. Start the engine again and turn the steering wheel a few times. If necessary, fill the reservoir with fluid to the maximum.

3. Check: Lower the vehicle. Start the engine and turn the steering wheel to check the effectiveness of the steering system under load.

Text 43. Power Steering Pressure Test

Source: <https://autoedu.info/en/auto-mechanic/steering-systems/power-steering-pressure-test/>

A pressure test of the power steering system is performed when the customer complains of difficult steering or when there are repeated hose failures. Newer models of vehicles with a hydraulic steering system contain a pressure sensor and through diagnostics, the pressure of the steering fluid in the steering system can be checked and monitored.

In vehicles that do not have a pressure sensor, a manometer is connected to the hydraulic part of the steering to measure the pressure of the steering fluid.

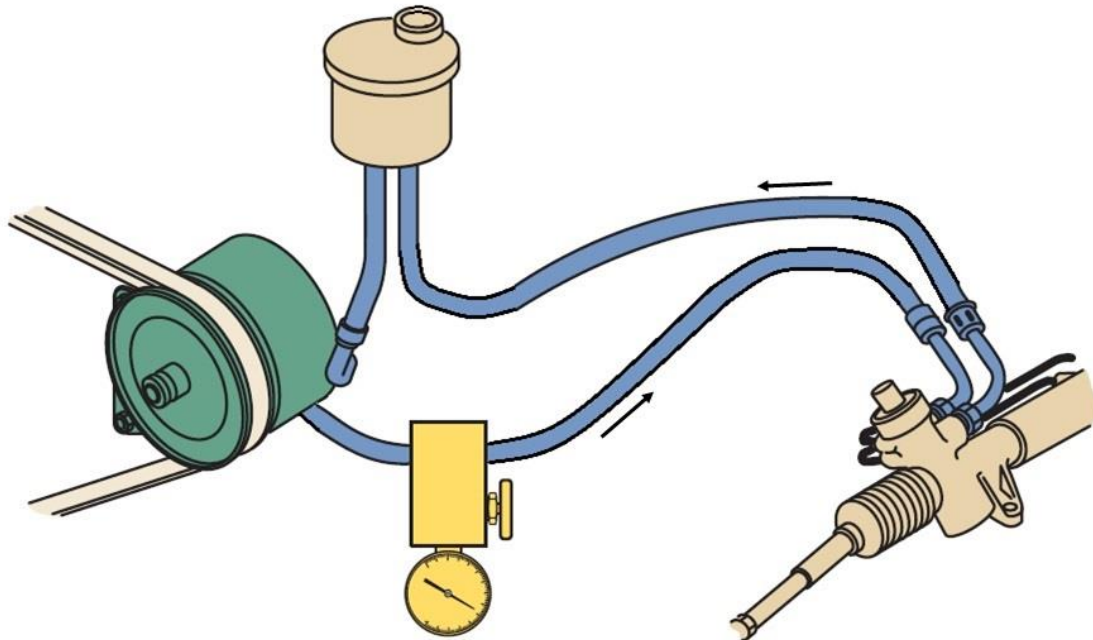
A suitable adapter with a valve and pressure gauge is installed on the drain line of the servo system. The working pressure, maximum pressure, and flow rate of the steering fluid are tested. The test checks the operation of the power steering pump, pressure regulator, control valve, pressure piston, and hose.



Power steering pressure tester

Connecting the pressure gauge is done with the engine off. Raise the vehicle so that the front wheels are off the ground. A container for collecting steering fluid is placed under the steering pump. Then the drain pressure hose is separated from the steering pump.

Be careful if the engine is hot because then the power steering fluid is also hot and can be under pressure. It is recommended to wait for a little so that the fluid cools down and the pressure in the hydraulic steering system drops.



Power steering pressure test

An adapter with a pressure gauge is connected to the place of the separated hose. Add steering fluid, and start the engine for 2 minutes to bleed from the steering system. That's how we prepared for testing.

Start the engine again. The steering wheel is in the neutral position (wheels in the straight-ahead position). The engine is idle, and the pressure is read from the manometer. When the pressure value is higher than required, check the power steering hoses for restrictions.

Then the valve on the manometer adapter is closed briefly two or three times (no longer than 5 seconds), and the highest measured pressure of the steering fluid is recorded. If the pressure is lower than the specification, the steering fluid supply is low, and the steering pump needs to be checked.

Finally, with the valve open and the engine running, the steering wheel all the way and read the pressure. In the same way, measure the pressure on the second full turn of the

steering wheel. The measured pressures on one and the other end stop of the steering wheel should be maximum and equal.

If there is maximum pressure on one and lower pressure on the other, replace the control box on the steering rack. If the measured pressures are below the maximum value, replace the servo pump with a new one.

When the pressure drops and the steering fluid cools, remove the manometer adapter and connect the pressure hose to the steering pump. Fluid is added, and the bleed from the steering system. Discarded steering fluid is properly disposed of by regulations for the disposal and storage of hazardous liquids.

If the vehicle has a pressure sensor in the power steering system, the pressure test procedure is the same, except that the pressure gauge is not installed. The pressure state from the sensor is monitored via a diagnostic tool.

To power steering pressure test, follow these steps:

1. Preparation: Raise the vehicle with a jack so that the front wheels are off the ground. Place the container under the steering pump. Disconnect the drain hose from the steering pump. Install an adapter with a pressure gauge between the pump and the drain hose. Add steering fluid and carry out the procedure to bleed from the hydraulic steering system.

2. Pressure measurement without turning the steering wheel: Start the engine and let it idle. Place the steering wheel in the zero position. Measure pressure and compare to specification. If the pressure is high, check the hoses for twisting and pinching.

3. Flow measurement: While the engine is idling and the steering wheel is in zero position, briefly (max 5 seconds) close the valve on the adapter two to three times and read the pressure. Compare the measured pressure with the specification. If the pressure is lower than specified, install a new steering pump.

4. Pressure measurement when turning the steering wheel: While the engine is idling, turn the steering wheel to one side and measure the pressure. Then turn the steering wheel to the other side all the way and measure the pressure. Compare the obtained results with the specification. If the pressure is maximum at one end and low at the other end, replace the control box. If both pressures are low, install a new steering pump. Turn off the engine, remove the pressure gauge, insert the removed hose, add oil, bleed and lower the vehicle.

Text 44. Power Steering Pump Replacement

Source: <https://autoedu.info/en/auto-mechanic/steering-systems/power-steering-pump-replacement/>

The power steering pump replacement is performed when, due to difficult and noisy steering, it is determined that the cause is a defective pump. The steering pump pushes the steering fluid under a certain pressure into the hydraulic system, where the steering box makes it easier to control the vehicle via the steering wheel.

It is necessary to determine the malfunction of the steering pump before replacing it. Often the symptoms that point to the pump, the cause of the malfunction can be a low fluid level or air inside the hydraulic part of the steering system.

Before removing the pump, it is necessary to familiarize yourself with the manufacturer's instructions on how to replace it. After determining the procedure, the vehicle is lifted with a hoist, and the power steering fluid is drained from the system and disposed of by legal regulations on environmental protection.

Removing the steering pump begins the disconnect of hoses from the pump. Then the drive belt is removed, and the condition is inspected. At the end of the removal, fasten the screws and remove the steering pump.

Installation of a new or overhauled steering pump is in reverse order.

To power steering pump replacement, follow these steps:

1. Preparation: Inform yourself of the instructions for removing the steering pump. Raise the vehicle with a hoist. Place the container under the steering pump. Drain the power steering fluid and the hydraulic steering system. Dispose of the removed power steering fluid according to regulations.

2. Removing the steering pump: Disconnect the hoses from the steering pump. Remove the drive belt from the pump pulley. Inspect the condition of the belt. Remove the mounting bolts and remove the power steering pump from the vehicle.

3. Installing the steering pump: Install in reverse order. Screw the pump into place. Install the drive belt (old belt if good or new). Connect the hoses to the pump. Add new steering fluid to the reservoir and perform the procedure of bleeding from the steering system. Test the operation of the steering pump.

Text 45. Steering Pump Pulley Replacement

Source: <https://autoedu.info/en/auto-mechanic/steering-systems/steering-pump-pulley-replacement/>

When the steering pump is replaced, the pulley is removed from the old one and mounted on the new pump. Also, when the grooves of the pulley are worn, cracks appear, or the pump shaft is loose, the steering pump pulley needs to be replaced.

Steering pump pulleys are installed on the shaft differently than other pulleys. They are mounted by pressing because the diameter of the shaft is slightly larger than the diameter of the pulley opening. The pulley will have to be pulled off the power steering pump shaft with a special puller.



Steering pump pulley



Tool for replacing the power steering pump pulley

Some pulleys are made of plastic and present an additional challenge, especially if they have become brittle. Since there are many different servos and pulleys, always consult the manufacturer's service manual before removal.

Never strike the drive shaft when removing and installing the pulley as this will damage the internal parts of the steering pump.

After removal, the pulley, nut, and pin are inspected for damage and wear. All worn parts are replaced.

To power steering pump pulley replacement, follow these steps:

1. Pulley removal: Place a suitable puller on the pulley according to the instructions. Use a suitable tool to block the rotation of the pulley. Tighten the middle bolt of the puller

to remove the pulley from the servo pump shaft.

2. Inspection of the condition: Inspect the pulley grooves for wear and damage. Check the condition of the pulley for cracks and damage. Inspect the segment pin for wear and damage.

3. Assembly of the pulley: Place the pulley on the shaft of the steering pump. Place the elements of the pulley mounting tool. Block the rotation of the pulley with a suitable tool. Turn the tool screw to press the pulley onto the shaft all the way.

Text 46. Replacing Power Steering Hoses

Source: <https://autoedu.info/en/auto-mechanic/steering-systems/replacing-power-steering-hoses/>

Replacing power steering hoses is performed when power steering fluid leaks, cracks, and bulging hoses are found during the check. Always refer to the manufacturer's service information before starting a replacement.



Power steering hoses

Steering fluid is under pressure in the supply hoses. When the hose bursts, it comes out under pressure and falls on the hot engine and exhaust system. The hot parts cause the power steering fluid to smoke and catch fire. Small leaks or leaks in the return line result in a low fluid level in the power steering pump reservoir and fluid ends up on the floor under the vehicle. If the steering fluid level gets low enough, it can cause a buzzing sound while driving. This noise is louder when steering the vehicle. If any of these symptoms are present, or to catch problems before they become this serious, the power steering hoses must be inspected regularly and replaced at any sign of wear.

Never attempt to patch or plug a leak at a hose or fittings. Hoses must not rub against other components as this can create a hole. The high-pressure hoses are multi-layered from rubber-coated braided steel with cast steel fittings at each end.

To replacing power steering hoses, follow these steps:

1. Removal of hoses: Place the container under the vehicle. While the engine is off, remove the return hose from the reservoir or steering rack. Allow the power steering oil to

drain into the drain pan. Loosen and remove all defective hose connections from the pump and steering wheel. Remove the hose.

2. Hose assembly: Before installation, compare the new and old hoses. Lubricate new seals or O-rings with steering fluid and install them on fittings. Mount the new hose on its connections and tighten it with the force specified in the instructions.

3. Checking the condition: If the drain hose was changed, connect it back. Pour new power steering fluid into the reservoir to the maximum. Perform bleeding from the system according to the given procedure. Start the engine and after a short warm-up, turn the steering wheel several times. Check the condition of the hoses and connections for leaks.

Text 47. Inspecting Mounting Bushings and Brackets

Source: <https://autoedu.info/en/auto-mechanic/steering-systems/inspecting-mounting-bushings-and-brackets/>

Inspecting mounting bushings and brackets are performed when the driver complains of poor steering or knocking while driving or cornering. Rubber bushings and brackets hold the steering rack in a horizontal position relative to the vehicle body. When they loosen, the bar moves during steering, which leads to difficult and irregular operation of the steering system.

Over time during vehicle use, normal wear and tear occur on rack bushings that become pinched, brittle, or torn, while brackets can become damaged, worn, loose, or fall off.

If the vehicle is leaking engine oil or power steering fluid, it may be leaking onto the bushings. Oil and fluid lead to softening and deterioration of the bushing. Before replacing the sleeve, it is necessary to repair the leak from the engine or steering system.

Raise the vehicle on a lift, keeping the weight of the vehicle on the wheels, if possible. First, a visual inspection of the bushings and brackets is performed for visible signs of any faults. Try moving the rack-and-pinion assembly up and down by hand. Any movement is observed.

Also, moving the steering wheel to one side or the other can cause rack-and-pinion bushings. The assistant rocks the steering wheel while the technician under the vehicle looks at the rack-and-pinion. If the movement is detected, first tighten the mounting bolts. If the rack still moves, it is necessary to replace the bushings and check the condition of the brackets.



Steering rack bushings and brackets

To inspect mounting bushings and brackets, follow these steps:

1. Inspection: Raise the vehicle to the appropriate height with a crane. Perform a visual inspection of the condition of the bushings and brackets. Move the rack-and-pinion up and down by hand. The assistant turns the steering wheel back and forth while watching the rack-and-pinion bushings for any movement. When there is movement, tighten the mounting bolts. If the rack still moves, it is necessary to replace the bushings and check the condition of the brackets.

2. Removal: Remove the bracket bolts. Remove the bracket and remove the bushings from the rack. Inspect the condition of the brackets for cracks and other damage. Replace the brackets if any irregularities are on them.

3. Assembly: Mount the new bushings on the steering rack. Place the brackets over the bushings. Fasten the brackets to the chassis of the vehicle with mounting bolts. Repeat the procedure of checking for movement of the rack. If everything is correct, lower the vehicle from the jack.

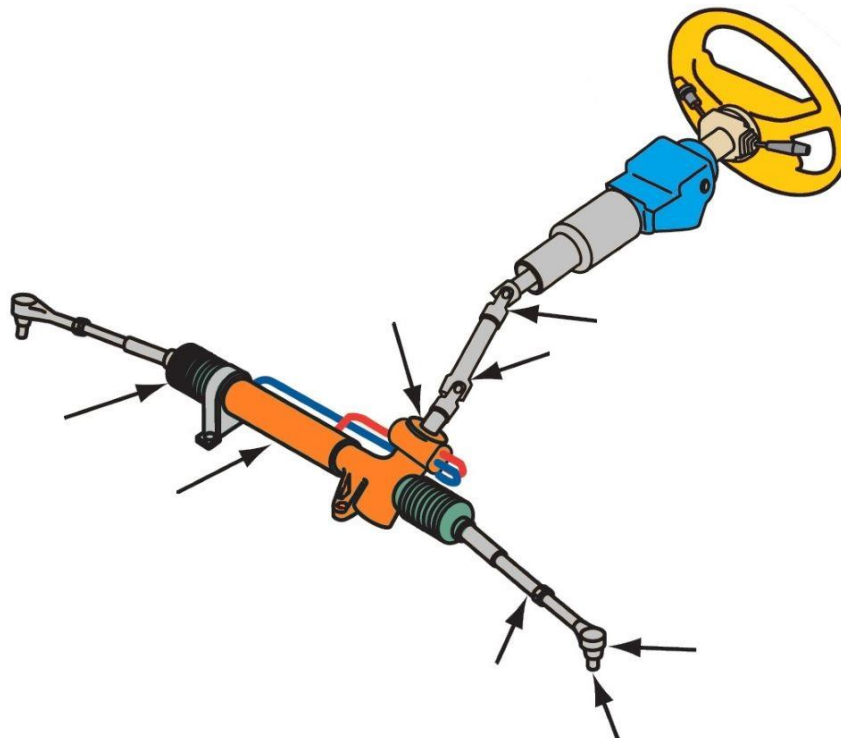
Text 48. Rack and Pinion Inspection

Source: <https://autoedu.info/en/auto-mechanic/steering-systems/rack-and-pinion-inspection/>

Rack and pinion inspection mean a detailed check of all elements from tie-rod ends, through the rack and pinion assembly to the control gear. A thorough inspection of the entire system is required to resolve the client's complaint about difficult driving. The rack and pinion system does not have a pitman arm, an idler arm, and a center link. It has a rack and pinion instead. That's why the rack and pinion system has fewer places for wear, which are reduced to the ends of the ties. Carefully check the rack and pinion steering linkage for leaks, which can cause the pump to run out of steering fluid and become damaged.

Inspecting the steering rack includes the ball joints, protective rubbers, tie ends, protective rubber bushings, internal tie-rod, rack connecting sleeves, mounting bolts, universal (Cardan) joints, and steering gear. Ribbed rubber bellows boot protects the bar from contamination. If any cracks, splits, or leaks exist, the boot should be replaced. Also, be sure that the clamps for the bellows are in their proper place and fastened tightly.

Inspecting the outer tie-rod end means checking for damage, leaks, and looseness. Grab each end and rotate to feel for any roughness that would indicate internal rusting. Be sure to check for bent or damaged forgings and studs, split or damaged seals, and damaged, out-of-round, or loose taper ends. If any of these conditions exist, it is necessary to replace those parts.



Rack and pinion inspection

To rack and pinion inspection, follow these steps:

1. Test couplings: Inspect universal joints for wear, looseness, or pinching. Grasp the pinion shaft at the U-joint and try to move it in and out of the gear. If it moves, the pinion bearing preload adjustment may need to be done. If it does not adjust, internal components have to be replaced.

2. Overview of the rack and pinion assembly: Inspect the rack housing for damage and excessive movement. If it moves, check the condition of the rack connecting sleeves and assembly support. Check for leaks. Inspect the ribbed bellows' boot and their clamps.

3. Tie-rod check: Check by feeling, moving, and the inner tie-rod socket inside the bellows. Loosen the inner bellows clamp and pull the bellows back, giving a clear view of the socket. If looseness is found in the tie rod, it should be replaced. Inspect the outer tie-rod ends. Move the tie-rod to the appearance of looseness and excessive play. If the damage and looseness are found, replace them.

Text 49. Rack and Pinion Replacement

Source: <https://autoedu.info/en/auto-mechanic/steering-systems/rack-and-pinion-replacement/>

Removing and replacing the steering rack is done after inspection of all parts of the system to ensure that problem is in the rack assembly. Many symptoms can indicate a malfunctioning rack assembly, such as wear, play, and rough or uneven steering. Regardless of the symptoms, all other steering problems should be considered and eliminated before removing or replacing the rack. Because these systems vary by vehicle type and manufacturer design, there is no uniform removal and replacement procedure, so the following steps are non-specific. Refer to service information and appropriate repair manual before replacement.

After reviewing the service information, start the engine and straighten the wheels. After turning off the engine, it is necessary to lock the steering column (steering wheel). This will keep the clock spring in a neutral position after the post is released, as it will not be able to rotate freely and damage the spool. Lift the vehicle with a hoist, and remove the front wheels.

First, the universal joint coupling is separated from the rack pinion shaft by removing the bolt or pin. If the same rack assembly is mounted, the coupling and pinion shaft are marked with paint before separation.

Then the hoses of the steering system are separated. Place an oil catch container under the power steering rack. Plug them to keep fluid from leaking.

After separating the steering wheel, move on to separating the outer tie-rod ends of the clamp from the knuckle. The cotter pins and nuts from the end of the tie rods are removed using an adjustable puller, fork, or hammer to remove the tie rod from the sleeve.

Finally, by removing the mounting screws of the bracket and bushings, the rack-and-pinion is released. Mark the position of the brackets and bushings if the same rack assembly is mounted. Due to its length, it is easiest to pull the rack-and-pinion assembly out through the vehicle's wheel well.

When removing the tie rod ends for reuse, record the number of turns during removal. An assembly of the rack is in reverse order. After mounting all the elements, it is necessary to perform wheel alignment.

To rack and pinion replacement, follow these steps:

1. Preparation: Read the instructions and repair manual. Start the engine and straighten the wheels. Turn off the engine and lock the steering column (steering wheel). Raise the vehicle with a hoist and remove the drive wheels. Prepare a container to collect the leaking steering fluid.

2. Removal: Mark the position of the joint coupling and the rack pinion shaft. Remove the bolt or pin and separate the joint coupling from the rack pinion shaft. Place the container under the rack and separate the hoses of the steering system from the rack. Plug the ends of the separated hoses. Remove the cotter pins and nuts from the end of the tie rods. Use a suitable tool to separate the tie rod ends of the clamp from the wheel sleeves. Remove the bracket and bushings rack and pinion. Mark the position of the bracket and bushings. Pull the rack-and-pinion assembly out through the vehicle's wheel well.

3. Assembly: Assembly is done in reverse order. Insert the rack assembly through the vehicle's wheel well. Place and tighten the rack using brackets and bushings. Connect and secure the joint of the tie rod end and the wheel sleeve. Connect the hoses of the steering system to the rack control box. Connect and secure the joint coupling of the steering column and the gear shaft. Mount the wheels. Add steering fluid and perform the procedure of bleeding from the steering system. Lower the vehicle and check the operation of the steering system.

Text 50. Inspecting the Steering Column

Source: <https://autoedu.info/en/auto-mechanic/steering-systems/inspecting-the-steering-column/>

Inspecting the steering column is necessary to detect malfunctions that can endanger the lives of the driver and the people around him. The steering wheel and column are responsible for transmitting the driver's steering input to the steering mechanism and onto the wheels, dictating the direction in which the vehicle should move. Any damage or failure to the steering wheel and column can cause the vehicle to move in unwanted directions. Regular inspection of the steering column and its components can identify problems before they become dangerous.

The steering column is always inspected when there are complaints of poor handling and when the vehicle is being repaired due to a frontal collision. If damage is evident, the damaged parts must be replaced. On the column, the condition of the holder, the joint connection with the gear shaft of the steering rack (U-joint), and the flexible joint are checked. When the steering wheel moves or steering is difficult, the condition of the steering column holder checking. If the fastening screws have loosened or the bracket has loosened, tighten and fasten the steering column. The condition of the couplings is visually inspected while someone turns the steering wheel to one side and the other. The U-joint must not have free play. When any play is observed, this joint must be replaced.

Steering columns are designed to deform in the event of an accident so that the steering column does not injure or kill the driver. The column has a sliding shaft that allows it to slide down when the rider is in contact with the steering wheel. Inspection of the collapsible part of the steering column is usually carried out if the vehicle has been in an accident and it is suspected that the column has moved. The check is done by looking at the flexible coupling under the dashboard when someone pushes the steering wheel back and forth. The movement of the column will be visible if this coupling is deformed.

To inspect the steering column, follow these steps:

1. Holder check: Check the steering column holders for looseness while turning the steering wheel. If the holders are loose, tighten the fastening screws. If the bracket is cracked, replace the steering column.

2. Checking the U-joint: Observe the condition of the U-joint while someone turns the steering wheel side to side. If there is free play, replace the U-joint.

3. Checking the flexible coupling: Observe the flexible coupling when someone moves the steering wheel back and forth. If the column moves, the coupling is deformed, and the steering column needs to be replaced.

Text 51. Suspension Systems

Source: <https://autoedu.info/en/auto-mechanic/suspension-systems/>

A suspension system ensures stability, controllability and comfort during driving. The suspension should provide contact between the wheel with the driving surface. The traction force of the vehicle is achieved through the tread surfaces of the tires. On the other hand, the suspension should dampen the vibrations and shocks that are transmitted from the uneven road through the wheels to the vehicle, which protects it from damage and wear, and at the same time makes driving comfortable.



Over time, wear occurs during use, while bumps and potholes on the road can cause damage to suspension system components. Complaints of the driver about the bouncing of the vehicle while driving, difficulty with controllability, and the appearance of knocking when crossing a rough road indicate the existence of irregularities in the suspension system. This may indicate a serious problem that affects driving safety.

During the conversation with the client (driver), we learn about complaints and observations about the suspension system. If necessary, we check the client's observations with a test drive. Based on the collected information, it is possible to check the condition of the elements of the suspension system.

Common customer complaints about the suspension system are:

- Vehicle drift.
- Turning the vehicle.
- Pulling the steering wheel to one side.
- Difficult handling.
- Impacts from the road are transmitted to the steering wheel.
- Loss of steering control when accelerating.
- Poor handling when turning.
- Resistance to the return of the vehicle in a straight line.
- Noise.

Regular inspection of all elements in the suspension system can detect component wear before serious problems occur. Also, check their mutual compatibility because their correctness alone does not guarantee the correctness of the entire suspension system.

Text 52. Sway Bar Link Replacement

Source: <https://autoedu.info/en/auto-mechanic/suspension-systems/sway-bar-link-replacement/>

One of the negative features of elastic suspension is the tilting of the vehicle in a curve. Use a sway bar link to reduce tilting.

The main task of the sway bar link is to counteract the non-parallel movement between the body and the suspension when the vehicle is cornering. Likewise, the sway bar link regulates the displacement of one wheel relative to the other and prevents the vehicle from tilting.

When the client complains that when driving in a curve, there is knocking, tilting and drifting of the vehicle, it is necessary to check the sway bar link. The most common irregularities on the sway bar link are the appearance of free movement, worn or torn ball end and, less often, a bent or cracked lever between two ball ends. The check is carried out by visual inspection of the condition and manual tensioning of the sway bar link to the appearance of free play.

After replacing the sway bar link, it is not necessary to adjust the wheel alignment.

To replace the sway bar link, follow these steps:

1. Checking the sway bar link condition: Raise the vehicle to the appropriate height with a hoist. Perform a visual inspection of the sway bar link for damage and condition of the ball end. By stretching, check whether there is an irregular movement of the ball end about the holder. If irregularities are detected, replace the sway bar link.

2. Removing the sway bar link: Remove the wheel. Adjust the height of the vehicle with a hoist. Unscrew ball end nuts with a suitable tool. Separate from the support and remove the sway bar link.

3. Installation of a new sway bar link: Place the new sway bar link in the support. Using the appropriate tool, tighten the ball end nuts, making sure that they take the correct position about the support. Mount the wheel and lower the vehicle from the hoist.



Text 53. Strut Bearing Replacement

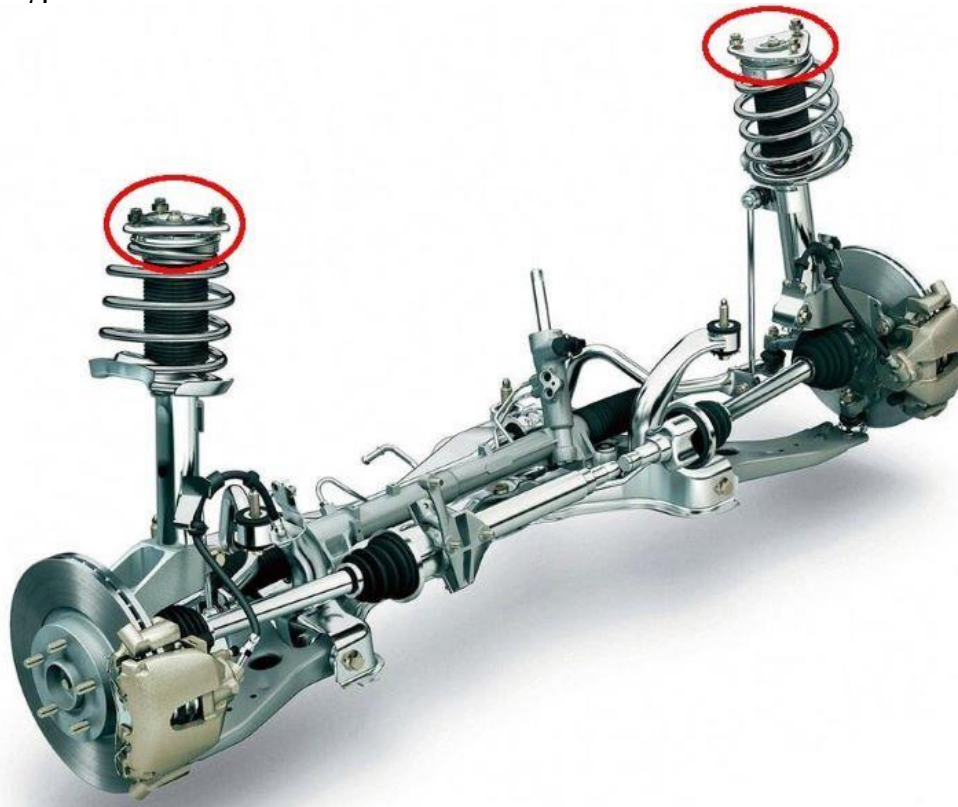
Source: <https://autoedu.info/en/auto-mechanic/suspension-systems/strut-bearing-replacement/>

Turning the steering wheel via the steering system moves the wheels. Since the shock absorbers are connected to the wheels, they suffer torsional stress. The other end of the shock absorber is attached to the vehicle body via a strut bearing. The torsion of the shock absorber due to the wheel's movement is transmitted to the strut bearing. The strut bearing task is to prevent torsion transfer from the shock absorber to the body.

The appearance of creaking and banging when turning the steering wheel indicates the possibility of a malfunction of the strut bearing. Over time, the rubber of the strut bearing weakens or gives way due to strong impacts. When twisting the shock absorber, the damaged strut bearing moves and makes a noise because it is not properly attached.

We can easily establish the correctness of the strut bearing. We start the engine, and the assistant on the spot turns the steering wheel to one side and the other. Place your hand

on top of the strut bearing during testing. If there is any noise or rotation, it is a sign that the strut bearing has suffered.



Before replacing the strut bearing, remove the shock absorber and spring from the vehicle. Vehicles usually have connected a shock absorber in a spring assembly and to the suspension system via two or three points (steering knuckle, vehicle body and/or sway bar link). After release, we remove the shock absorber and the spring from the vehicle.

We fix the shock absorber on the workbench with a vice. Before removing the strut bearing, we must secure the springs with a special blocking tool. It is necessary to be extremely careful when releasing the spring to avoid an accident. When the spring is blocked, we carefully unscrew the screw on the top of the shock absorber that holds the strut bearing and the spring. After replacing the strut bearing, turn the screw back and gently release the spring with increased precautions.

We install the shock absorber with a spring on the vehicle in the reverse order.

To replace the strut bearing, follow these steps:

1. Removing shock absorbers and springs from the vehicle: Raise the vehicle to the appropriate height with a hoist. Remove the wheel. Separate the brake hoses and cables from the shock absorber mount. Separate the sway bar link from the shock absorber. Separate the shock absorber from the steering knuckle. Separate the upper part of the shock absorber from the vehicle body. Remove the shock absorber and springs from the vehicle.

2. Strut bearing replacement: Fix the shock absorber with a spring on the workbench with a vice. Block the spring with a special blocking tool. Unscrewing the spring, release and remove the old strut bearing. Place the new strut bearing on the shock absorber support and fasten it with a screw. Carefully release the springs.

3. Installation of shock absorbers and springs on the vehicle: Place the shock absorber with spring on the shock absorber support of the vehicle body. Fasten the shock absorber bracket to the vehicle body with a screw. Install and fasten the steering knuckle and sway bar link to the shock absorber with screws. Fasten the removed hoses and cables to the shock absorber support. Put the wheel back and lower the vehicle from the hoist.

3.3. Greatest innovations and inventions of automobile engineering: from the first engine to today

Text 1. The Steam Engine Kicked Things Off

Sources: <https://interestingengineering.com/transportation/20-greatest-innovations-and-inventions-of-automobile-engineering-from-the-first-engine-to-today>, Stephen Foskett/Wikimedia Commons

The steam engine was one of the first innovations in automobile engineering. Although originally developed to pump water out of mines, improvements over time would drastically shrink the size of the engine.

The first reliable steam engine was developed by James Watt in 1775 and this was, in turn, a refinement of the earlier Newcomen engine.

Steam engines would initially lead to the development of locomotives and steam-powered ships, but the technology was refined for use in early cars around the 1850s. Steam cars outnumbered other forms of propulsion among very early cars, and fuel was relatively cheap as well.

The fate of the steam engined car was sealed when Henry Ford fully developed his mass production process. Electrical starters for internal combustion engines also removed the need for the hand-crank engine, and internal combustion engine-driven cars would ultimately win out as they were much cheaper to buy.

Text 2. The Internal Combustion Engine Made Cars ‘Cheap’

Sources: <https://interestingengineering.com/transportation/20-greatest-innovations-and-inventions-of-automobile-engineering-from-the-first-engine-to-today>, Bruno/Pixabay

The internal combustion engine made cars ‘cheap’. The internal combustion engine is, by any standards, the de facto reason for the existence of the automobile today. Although various examples of early engines had been around since the 1700s, Etienne Lenior produced the first reliable one in 1859.

The modern internal combustion engine, as we know, was developed when Nikolaus Otto patented his ‘atmospheric gas engine’ in 1864. Later developments were made by George Brayton (the first liquid-fuel engine) and collaboration between Otto, Daimler, and Maybach gave the world the first four-cycle engine in 1876.

The two-stroke engine was developed by Karl Benz a little later, in 1879, and the production of Benz’s first commercial motor vehicles commenced in 1886.

Text 3. The Starter Rendered Hand Cranks Obsolete

Source: <https://interestingengineering.com/transportation/20-greatest-innovations-and-inventions-of-automobile-engineering-from-the-first-engine-to-today>

Internal combustion engines essentially work on a feedback system that relies on inertia from each cycle to initiate the next. For this reason, early cars needed a way to rotate (crank) the engine initially, to allow it to run on its own power.

Early engines used a variety of methods to achieve this, from gunpowder cylinders to springs, to brute force – using the iconic crank handle. Although effective, these methods were inconvenient, difficult, and could even be dangerous. Engines would often ‘kick-back’ making the process was less than predictable.

What was needed was a less laborious, more convenient, and predictable means of starting the engine.

The first electric starter was developed in England in 1896 by H. J. Dowsing. The first U.S. patent for an electric starter was granted in 1903, with a patent for an improved version in 1911. The first cars to have electrical starters installed were produced by Cadillac in 1912.

Starter motors are of course now standard in automobiles, but their rise was not guaranteed, and cranks were still in use well into the 1920s. Interestingly, hand cranks were still supplied by some manufacturers as late as the production of cars like the Citroen 2CV (1948-1990). They were provided as a way to start the car in case the starter or battery failed.

Text 4. The Diesel Engine is Pretty Efficient

Source: <https://interestingengineering.com/transportation/20-greatest-innovations-and-inventions-of-automobile-engineering-from-the-first-engine-to-today>

The diesel engine, or compression-ignition (CI) engine, was developed by Rudolf Diesel and is still today the highest thermal efficiency of any practical internal combustion engine. In some cases, low-speed diesel engines can have a thermal efficiency of just over 50%.

As the name suggests, the ignition of the fuel is accomplished by mechanical compression of the air in the combustion chamber, to such a degree that injected atomized diesel ignites instantaneously (adiabatic compression). This contrasts with the spark-ignition of petrol or gas engines.

Rudolf Diesel, after almost being killed by an earlier ammonia vapor fueled steam engine, decided to base his new engine on the Carnot Cycle instead. Soon after Karl Benz was awarded his patent in 1893, Diesel published his groundbreaking treatise 'Theory and Construction of a Rational Heat-engine to Replace the Steam Engine and The Combustion Engines Known Today'.

The diesel engine was born.

Text 5. Anti-lock Brakes Have Helped to Save Lives

Sources: <https://interestingengineering.com/transportation/20-greatest-innovations-and-inventions-of-automobile-engineering-from-the-first-engine-to-today>, Pixabay

Anti-lock brakes or anti-skid braking systems (ABS), are actually a pretty old piece of automobile engineering. Although modern systems were introduced in the 1950s aero-industry and became popular in cars from the 1970s onwards, the concept actually dates from as early as 1908.

Modern systems allow the car to maintain tractive contact with the road during braking, thus preventing the wheels from locking, or ceasing to rotate, and therefore causing the vehicle to skid. The system is automated and takes advantage of the principles of threshold and cadence braking practiced by skilled drivers using the previous generation of braking systems.

The first patented 'ABS' was developed by German engineer Karl Wessel in 1928, but he would never develop a working product. During the 1950s, the technology began to take shape, with Dunlop Maxaret's anti-skid system, which was used extensively on UK jet aircraft like the Avro Vulcan and English Electric Lightning.

A truly modern system was introduced by Chrysler and was a computerized, three-channel, four-sensor all-wheel ABS. It was called 'Sure Brake' and came as standard on their 1971 Imperial. Other car manufacturers followed suit over the following decades, and ABS was introduced on motorcycles in the 1990s.

Text 6. Automatic Transmission Made Driving Easier

Sources: <https://interestingengineering.com/transportation/20-greatest-innovations-and-inventions-of-automobile-engineering-from-the-first-engine-to-today>, Ritchyblack/Wikimedia Commons

Automatic transmission, auto, or self-shifting transmission is another great innovation in automobile engineering. The automated system frees the driver from the need to change gear ratios manually as the vehicle is on the move.

Although less responsive and more prone to faults than manual transmissions, this innovation reduced the number of elements that a driver needs to control use in order to drive. This has obvious advantages for individuals with disabilities, and also makes cars easier to drive overall.

The automatic transmission was originally developed in 1921 by Alfred Horner Munro, a Canadian. He patented his design in 1923 and acquired the UK and the US patents in 1924 and 1927, respectively.

Munro was actually a steam engineer, and his early design used compressed air rather than hydraulic fluid, as used by modern systems. Sadly, he never found a commercial application. Two Brazilian engineers, José Braz Araripe and Fernando Lely Lemos developed a hydraulic fluid version in 1932 and sold their design to General Motors in 1940.

Text 7. Power Steering Made Driving More Pleasurable

Sources: <https://interestingengineering.com/transportation/20-greatest-innovations-and-inventions-of-automobile-engineering-from-the-first-engine-to-today>, OSX/Wikimedia Commons

Power steering or power-assisted steering (PAS), is another great innovation in automobile engineering and helps drivers steer their cars more easily. The use of hydraulic or electric actuators allows drivers to exert much less effort when turning the steering wheel than in not PAS fitted vehicles, especially at low speeds or when stationary.

Early versions of power steering were patented in 1876, 1902, and 1904, but none of these made it into production. The first practical system was devised in 1926 by Francis W. Davis. He later moved to General Motors and further refined his designs.

Chrysler Corporation was the first to make power steering commercially available in a passenger car, incorporating the technology into their 1951 Imperial. GM quickly followed suit with their 1952 Cadillac.

Today, most vehicles come with power steering as standard.

Text 8. Airbags: Saving Lives with the Power of Air

Source: <https://interestingengineering.com/transportation/20-greatest-innovations-and-inventions-of-automobile-engineering-from-the-first-engine-to-today>

After the seatbelt, airbags are one of the most important innovations in vehicle safety and automobile engineering. They are designed to inflate extremely quickly during collisions, impacts, or sudden rapid deceleration and deflate equally as fast.

This technology has saved thousands of lives since its mass adoption in the automobile industry.

Airbags can trace their origin to air-filled bladders used as early as the 1950s. Their invention is widely credited to John W. Hetrick, who registered his patent in 1951. A similar system was also patented in Germany by Walter Linderer at about the same time. Both systems used compressed air that was triggered using a spring, bumper contact, or manually by the driver.

It would take the development of crash sensors in the 1960s for the technology to become widely adopted. Mercedes-Benz, GM, Ford, and Chrysler would include them in their cars from the 1970s, but they wouldn't become standard until the 1990s.

Text 9. Electric Car Engines Are a Thing of the Past and Future

Sources: <https://interestingengineering.com/transportation/20-greatest-innovations-and-inventions-of-automobile-engineering-from-the-first-engine-to-today>, Henrysirhenry/Wikimedia Commons

Electric car engines have been around for much longer than you might expect. Although hybrid or all-electric vehicles are now used in huge numbers, the first practical production electric car actually appeared in London in 1884.

Another design, the *Flocken Elektrowagen*, was produced in Germany in 1888. Cars powered by electric engines, along with those powered by steam, actually outsold cars powered by internal combustion engines in the early years of the automotive age, at least before the advent of the electric starter engine.

The early electrical cars were popular in the late 1800's and early 1900's, as they offered a level of comfort and ease of use not achieved by rival technologies at the time. It is estimated that around 30,000 such vehicles had been produced by the turn of the 20th century.

The internal combustion engine would ultimately win out, shunting electrical cars into the shadows until their renaissance in the late 20th century.

Text 10. GPS – U.S. Military Tech Getting You from A to B

Sources: <https://interestingengineering.com/transportation/20-greatest-innovations-and-inventions-of-automobile-engineering-from-the-first-engine-to-today>, Pixabay

The GPS or Global Positioning System, was originally developed by the United States Government for use by the armed forces. The U.S. Department of Defense (DoD) decided to use satellites to support a new navigation system. The first Navigation System with Timing and Ranging (NAVSTAR) satellite was launched in 1978.

The first GPS system used 24 satellites and became fully operational in 1995. Credit for its creation is often given to Roger L. Easton, Ivan A. Getting, and Bradford Parkinson.

Civilian use of the system was allowed from as early as the 1980s and today the GPS constellation consists of 31 satellites and GPS systems that have since become integrated into many modern technologies, from smartphones to cars, and have revolutionized the way we all navigate.

Text 11. Catalytic Converter: Improving Air Quality Since the 1970s

Sources: <https://interestingengineering.com/transportation/20-greatest-innovations-and-inventions-of-automobile-engineering-from-the-first-engine-to-today>, Hermann Luyken/Wikimedia Commons

The catalytic converter is one of the most important automobile engineering innovations of all time. Its ability to convert toxic gases and other pollutants into less-hazardous forms has improved the air quality of our cities drastically.

The basic concept is that exhaust gases are passed through the converter, catalyzing them into less-toxic forms in a redox reaction. The converters have become a legal requirement on diesel and gasoline engines, but can also be fitted to lean-burn engines, as well as kerosene heaters and stoves.

Catalytic converters were the brainchild of Eugene Houdry, a French engineer, who'd moved to the U.S. in 1930. He was shocked by the level of smog and pollution in Los Angeles when he arrived and decided to try to solve the problem. By the mid-1950's he had been granted a patent for his technology.

It took stricter environmental regulations around the world for the mass adoption of catalytic converters in cars. The first production converter, an improvement on Houdry's design, was produced in 1973. They were first introduced on cars in the U.S. from 1975, to comply with the EPA's stricter regulations on exhaust emissions.

Text 12. Saving Lives with the Three-point Seat Belt

Sources: <https://interestingengineering.com/transportation/20-greatest-innovations-and-inventions-of-automobile-engineering-from-the-first-engine-to-today>, State Farm/Wikimedia Commons

The now-ubiquitous three-point seat belt is designed to spread the rapid deceleration energy from a collision over the chest, pelvis, and shoulders of the wearer. It was first introduced by Volvo in 1959 and was developed by Nils Bohlin, who had previously worked for SAAB developing ejection seats.

Before this innovation, the two-point seat belt was the standard. These strapped across the body, with a buckle placed over the abdomen. These were known to cause serious internal injuries during high-speed crashes.

This great innovation in automobile engineering first appeared in the Volvo PV 544 but became standard in the 1959 Volvo 122. Volvo would later make the patent for the device open-source, in the interest of safety for the general public and the industry at large.

According to the U.S. National Highway Traffic Safety Administration, these belts save around 11,000 lives every year.

Text 13. Improved Fuel Efficiency with the Hybridized Drivetrain

Sources: <https://interestingengineering.com/transportation/20-greatest-innovations-and-inventions-of-automobile-engineering-from-the-first-engine-to-today>, Mario Iorio/Wikimedia Commons

When Toyota released the first Prius for sale to the public in 1998, few would appreciate the impact it would eventually have on the auto industry.

This car incorporated a hybrid, electric-gasoline drivetrain that dramatically improved fuel efficiency and reduced emissions, forcing other car manufacturers to follow suit.

The Prius was the first mass-produced hybrid. It came with a small 1.5-liter gas engine, electric motor, and nickel-metal hydride battery.

Although uptake was slow at first, today most car brands have some form of hybrid vehicle in their catalog. In many parts of the world, they are replacing solely gasoline-powered vehicles, which are being phased out.

Text 14. Dual-clutch Transmission Made Gear Shifts Seamless

Sources: <https://interestingengineering.com/transportation/20-greatest-innovations-and-inventions-of-automobile-engineering-from-the-first-engine-to-today>, Matti Blume/Wikimedia Commons

Dual-clutch transmission (DCT) allows for a driver to rapidly switch between gears, giving enhanced and seamless speed compared to more traditional transmissions. It has resulted in a transmission that is as easy to use as an automatic transmission, and as responsive as a manual transmission.

On a typical, six-speed DCT gearbox, one clutch will handle odd gears whilst the other will shifts even gears. Gear changes are controlled by a series of computers.

The concept was initially devised by a Frenchman, Adolphe Kégresse, before WWII, but he never made a working model.

DCT was first introduced in racing cars in the 1980s and was first brought to the general public by Volkswagen. Their first dual-clutch transmission was launched in 2003.

It has since become widely available in many other automotive brands, including Lamborghini and Mercedes-Benz.

Text 15. Stability Control Helped Stop Skids

Source: <https://interestingengineering.com/transportation/20-greatest-innovations-and-inventions-of-automobile-engineering-from-the-first-engine-to-today>

ESC or electronic stability control helps correct a skid if a car starts to slide. It is, in effect, an improvement in the anti-lock brake systems that preceded it. ESC produces a marked improvement in car safety, especially during emergency situations.

As ESC yaw sensors detect a slide, the system applies the brakes to individual wheels to help correct the skid and straighten the car. Some ESC systems also take control of the throttle to manage power to each wheel as well.

Mercedes-Benz and BMW brought ESC to their luxury car market in the mid-1990s. From 2011, ESC became a legal requirement in passenger cars in many countries.

Text 16. Onboard Diagnostics II Improved Engine Management

Sources: <https://interestingengineering.com/transportation/20-greatest-innovations-and-inventions-of-automobile-engineering-from-the-first-engine-to-today>, Conrad

Onboard diagnostics II, OBD II for short, was the natural progression from the first onboard diagnostics systems developed in the 1980s.

Its introduction provided both home mechanics and professional technicians a means of more easily determining what exactly is wrong with a vehicle through a series of codes.

OBD II also allowed for a considerably more sophisticated method of controlling the engine, improve fuel efficiency, etc.

Although it was initially hated by car enthusiasts and mechanics, the system has sparked a new industry of scan tools and other aftermarket devices, ranging from fuel economy meters to engine performance tuners.

Text 17. Smart Key (Fob) and Flashing Turn Signals

*Sources: <https://interestingengineering.com/transportation/20-greatest-innovations-and-inventions-of-automobile-engineering-from-the-first-engine-to-today>, Screw-
sHirsch/Wikimedia Commons*

The traditional metal key is fast becoming a living fossil in the auto industry. Smart key fobs or smart keys are used for effortless engine ignition. They become the new standard, allowing engine ignition with the press of a button rather than the turning of a key.

Some even start the car as you approach. These were once just a novelty, with some early designs resembling a credit card. The fobs are thought to make cars harder to steal, although they can leave vehicles open to car hacking.

Another minor, yet important, automobile engineering innovation is the flashing turn signal (indicator). Flashing turn signals let other drivers know your intentions. Early

forms date to 1907, but the version patented in 1938 is the one now used widely and is generally required on all street-legal cars.

These signals are required to blink on and off at a rate between 60 and 120 ‘blinks per minute’. Older models used a thermal interrupter switch to provide the ‘blink’ but these have been replaced with transistor circuits.

Text 18. Turbochargers Increase Energy Power and Fuel Efficiency

Sources: <https://interestingengineering.com/transportation/20-greatest-innovations-and-inventions-of-automobile-engineering-from-the-first-engine-to-today>, NASA/Wikimedia Commons

Turbochargers or turbos, have been used in production cars since the 1960s. They are effectively a compressor that is driven by the cars’ exhaust gasses and force more air into the engine’s cylinders.

More air leads to more power and can make a smaller engine perform outside of its class. They are commonly used with Otto and Diesel cycle engines. The technology was invented by Swiss engineer Alfred Buchi who received a patent for it in 1905. The technology would initially find applications in aircraft engines, especially during WWII (World War II).

Today, car manufacturers are generally working to downsize their engines while including turbocharged alternatives. This simultaneously boosts performance and increases fuel efficiency.

Text 19. Cruise Control Paved the Way for Driverless Cars

Sources: <https://interestingengineering.com/transportation/20-greatest-innovations-and-inventions-of-automobile-engineering-from-the-first-engine-to-today>, Santeri Viinamäki/Wikimedia Commons

Cruise control was first developed by Ralph Teeter in the 1940s. He developed the technology in response to his belief that uneven speeds caused accidents.

Teeter developed a servomechanism to help maintain the car’s speed by taking control of the throttle from the driver. Although unpopular when first introduced in the 1950s, it now comes as standard in many cars today.

The addition of radar to cruise control in the early 2000s has taken the technology to the next level. It has also paved the way for the advent of driverless cars.

Text 20. The Blindspot Mirror Helped Drivers Spot Each Other with Ease

Sources: <https://interestingengineering.com/transportation/20-greatest-innovations-and-inventions-of-automobile-engineering-from-the-first-engine-to-today>, Josh Ferris/Flickr

Blindspot mirrors, as the name suggests, are mirrors that are specially designed to help the driver see areas around their car which are normally obscured from view. Usually attached to a car’s side-view or wing mirrors, these simple devices helped make driving a lot safer.

However, innovations in mirror technology may render them obsolete in the not-too-distant future. Interestingly, side view mirrors in and of themselves only began to appear in the 1960s. Prior to this many roads were unpaved and only had two lanes (one in each direction).

Drivers only really needed to be concerned with the goings-on directly in front and behind their vehicles.

Text 21. The Pneumatic Tire Was Revolutionary

*Sources: <https://interestingengineering.com/transportation/20-greatest-innovations-and-inventions-of-automobile-engineering-from-the-first-engine-to-today>,
Geni/Wikimedia Commons*

Yet another great innovation in automobile engineering was the development of the pneumatic tire. In its simplest form, this consists of a simple donut of rubber filled with compressed air that provides a more comfortable and effective means of absorbing shock and carrying loads.

The first recorded patent for the technology was filed by Robert William Thomson in 1845, in England. His design consisted of a hollow leather tire filled with, yes, you've guessed it, air. Called 'aerial wheels', they proved to be less popular than Thomson's solid rubber tires of the same period.

With the rise in popularity of the bicycle in the late-1800s, interest in pneumatic tires was reignited. And so, in 1888, John Boyd Dunlop, a veterinary surgeon from Belfast, Northern Ireland, obtained patents for his bicycle pneumatic tires. For cars, the first pneumatic tires were first developed by the French rubber manufacturer Michelin & Cie.

Text 22. LED Headlamps Were Also an Interesting Development

*Sources: <https://interestingengineering.com/transportation/20-greatest-innovations-and-inventions-of-automobile-engineering-from-the-first-engine-to-today>, Kickaf-
fe/Wikimedia Commons*

LED headlamps are yet another important innovation in automobile engineering. They first began to appear in around 2004, and have gone from strength to strength ever since.

Unlike their predecessors, LED headlamps tend to have longer lifespans and consume less electricity compared to halogen, tungsten, and high-intensity discharge alternatives. They can offer significant other benefits, too, including lower maintenance costs and increased visibility.

From around 2006, the first series-production LED low beams began to be factory-installed in vehicles like the Lexus LS 600h. The following year, the first headlamps to use LEDs for all functions were introduced on the V10 Audi R8 sports car.

Text 23. The Rearview Backup Camera Helps Prevent Accidents

*Sources: <https://interestingengineering.com/transportation/20-greatest-innovations-and-inventions-of-automobile-engineering-from-the-first-engine-to-today>, Al-
tair78/Wikimedia Commons*

The rearview backup camera, also known as a reversing camera or simply rear-view camera, has made reversing your car a lot safer and more convenient.

Specifically designed to avoid collisions while reversing, these video cameras and onboard screen setups effectively remove rear blind spots for the driver. But they are not a new innovation.

Some of the first backup/reversing camera systems were used in a 1956 Buick Century concept car. Consisting of a rear-mounted television camera, it sent images to a TV screen located in the dashboard in place of a regular rear-view mirror. One of the first production cars to feature this technology was the Toyota Soarer Limited UZZ31 and UZZ32, which was only available in Japan in the early-1990s.

Aftermarket options for cars have been available for some time, but many production cars today come with them fitted as standard. Some nations, including the U.S. and Canada, now mandate that all new production cars must have them fitted by law.

Text 24. Collision Avoidance Technology Is Another Significant Advancement

Sources: <https://interestingengineering.com/transportation/20-greatest-innovations-and-inventions-of-automobile-engineering-from-the-first-engine-to-today>, NTSB/Twitter

Yet another important innovation in the automotive industry are collision avoidance technologies or systems (CAS). Also known as driver assistance systems, this technology helps to prevent human error in collisions to prevent or reduce their severity as much as reasonably practicable.

Modern systems tend to have a range of capabilities, from simple warnings to the driver, to complete autonomous take over of the vehicle's systems to avoid or mitigate an impending accident.

In their most basic form, CAS' consist of forward-collision systems which monitor a car's speed and the speed of the vehicle in front of it (if any). The system constantly monitors the distance between the two vehicles and provides a warning if the driver, in the system's view, is getting too close.

In many countries today, new cars must come with autonomous emergency braking systems to prevent potentially serious crashes. Other systems may also feature a lane departure warning system that will warn the driver if they begin to stray out of their lane.

Text 25. Connected Mobile Apps in Cars Are Being Developed in Earnest

Sources: <https://interestingengineering.com/transportation/20-greatest-innovations-and-inventions-of-automobile-engineering-from-the-first-engine-to-today>, pxfuel

The growth of the Internet of Things (IoT) has also reached the automobile industry. One area is the recent explosion in connected mobile apps especially tailored for use with automobiles.

Having the ability to partially interface your mobile device with your car has been around for some time, like Bluetooth connectivity, but there is a real push to develop APIs to connect many other apps on your phone to your car. Today, many automakers are working closely with various app developers to make this a reality.

From infotainment to onboard car diagnostics, this area is predicted to see massive growth over the next few years, according to Price Waterhouse Cooper.

Text 26. Vehicle Tracking Software, Remote Vehicle Shutdown, and Sentry Mode Are Revolutionizing the Automobile Industry

Sources: <https://interestingengineering.com/transportation/20-greatest-innovations-and-inventions-of-automobile-engineering-from-the-first-engine-to-today>

Another important innovation in automobile technology is the advent of vehicle tracking software and remote vehicle shutdown and/or sentry mode.

Some brands, like Tesla, offer this as standard with their range of vehicles, while aftermarket/third-party options are also widely available for many different vehicles.

Using a combination of GPS and IoT, today's vehicle owners have a range of weapons at their disposal to counter vehicle theft.

While there are some serious security risks with these kinds of innovations, many believe the pros outweigh the cons.

Text 27. Regenerative Braking Is Yet Another Big Automobile Industrial Innovation

Sources: <https://interestingengineering.com/transportation/20-greatest-innovations-and-inventions-of-automobile-engineering-from-the-first-engine-to-today>, Geni/Wikimedia Commons

Another big innovation in the automobile industry is regenerative braking. An energy recovery mechanism, regenerative braking slows down a vehicle by converting some of its kinetic energy into a form that can be either be used immediately or stored until needed. These systems usually consist of an electric traction motor that uses the vehicle's momentum to recover energy that would otherwise be lost as heat. Such systems not only improve the overall energy efficiency of the vehicle but also extend the life of the braking system due to the reduced wear on the braking system's mechanical parts.

The technology has its origins in the late 1800s, and actually began to appear on trains as early as the 1930s. Today, many automakers, including Toyota, Peugeot, BMW, and Volkswagen, have begun to include them as standard, notably in VW's BlueMotion series of cars.

Text 28. BladeScan Technology Could Be the Future of Automobile Headlights

Sources: <https://interestingengineering.com/transportation/20-greatest-innovations-and-inventions-of-automobile-engineering-from-the-first-engine-to-today>, Lexus

Currently, an option only on new Lexus, BladeScan technology is shaping up to be another important innovation for the automobile industry.

Building on their expertise in LED headlights and adaptive high-beam headlights, Lexus is now rolling out their next automotive lighting pioneering work.

BladeScan technology delivers more precise photometric control of the area of illumination in front of the car, being accurate to within 0.7 degrees.

It also offers a broader distribution of light to brighten areas that would not normally be illuminated with a conventional high-beam system.

Text 29. ClearSight Ground View and Rearview Mirrors

Sources: <https://interestingengineering.com/transportation/20-greatest-innovations-and-inventions-of-automobile-engineering-from-the-first-engine-to-today>, Jaguar Land Rover

And finally, Jaguar Land Rover's ClearSight ground and rearview mirror technology is another potentially revolutionary innovation in automobile safety. Using a combination of cameras and a rearview mirror-integrated display, these devices provide the driver with unprecedented views at strategic points around the vehicle.

It was first unveiled by Land Rover at the February 2019 Chicago Auto Show and is now available in their 2020 range of Rover Evoque.

'The Land Rover ClearSight rear-view mirror uses a rear-mounted camera to display a wide-angle camera view of what's behind your vehicle right on your rear-view mirror. So even if you have tall people sitting in the back seat or your cargo area is piled high with camping equipment, furniture, or moving boxes, you'll have no problems backing up.'

3.4. Latest technologies, trends & innovations in automotive industry

Text 1. Autonomous Vehicles

Source: <https://www.startus-insights.com/innovators-guide/automotive-industry-trends-10-innovations-that-will-impact-automotive-companies-in-2020-beyond/#trend-one>

Self-driving or autonomous vehicles (AVs) minimize the need for human drivers and look poised to transform everyday transportation. Fleets of AVs expand the scope of last-mile deliveries, reduce downtime, and aim to make public transportation relatively safer. For example, by reducing accidents caused due to driver fatigue or negligence. AVs

are equipped with advanced recognition technologies, such as AI-enhanced computer vision to identify obstacles along the route.

The US-based startup *Intvo* increases AVs safety by developing a pedestrian behavior prediction technology. Unlike two-dimensional (2D) and three-dimensional (3D) object detection technologies that consider limited parameters, their solution checks for head position, eye contact, and leg movements of the pedestrians, weather conditions, and assigns a risk level. This reduces false positives in pedestrian detection and enhances the safety of autonomous vehicles.

The US-based startup *Udelv* provides autonomous vehicles for last-mile deliveries. It combines advanced AI algorithms and hyper-speed teleoperations for human-assisted guidance in unique situations. The startup's vans have a payload capacity of approx. 360 kg and reach speeds up to approx 100 km/h. The vans deliver groceries from nearby stores and send out a push notification when the order arrives.

Text 2. Vehicle Connectivity

Source: <https://www.startus-insights.com/innovators-guide/automotive-industry-trends-10-innovations-that-will-impact-automotive-companies-in-2020-beyond/#trend-one>

Nowadays, vehicles come with a tamper-proof digital identity that differentiates them from other vehicles in the network. This enables easy tracking of vehicular data for various use cases such as insurance, driver safety, predictive maintenance, and fleet management. Sharing vehicular data helps not just the individual customer, but overhauls the entire mobility ecosystem. Startups and scaleups develop vehicle connectivity that enable them to connect and exchange data with other vehicles (V2V), an electric vehicle grid (V2G), public infrastructure (V2I), as well as with new and emerging ways to utilize vehicle data (V2X).

British startup *V2X Network* offers a vehicle-to-everything (V2X) platform for autonomous transactions that combines geo-networking and caching to enable low latency real-time communication. The platform runs on distributed ledger technologies (DLTs) and allows for a high degree of scalability. The startup uses enterprise-grade encryption in order to provide users control over their data to enhance security and privacy measures.

Israeli startup *NoTraffic* develops an AI-powered traffic signal platform that digitizes road infrastructure management and connects drivers to the city roadways to manage various traffic-related challenges. The data of all road users is streamed and processed in real-time to empower smart mobility. The solution also serves as the base for additional services such as micropayments and micro-mobility.

Text 3. Electrification

Source: <https://www.startus-insights.com/innovators-guide/automotive-industry-trends-10-innovations-that-will-impact-automotive-companies-in-2020-beyond/#trend-one>

The depleting fossil fuel reserves and the harm to the environment caused by their use call for promoting the use of electric mobility solutions. For greater adoption, electric vehicles (EVs) need to address issues such as high price, poor battery, inadequate charging infrastructure, fleet electrification, as well as powering renewable energy-based charging grids. These challenges, along with the need to tackle increasing greenhouse gas emissions across the world, are being solved with startups working on electrification solutions.

The US-based startup *Lordstown Motors Corps* makes an all-electric pickup truck. The truck, *Endurance*™, is designed to be a sturdy work vehicle and comes with fewer moving parts compared to traditional commercial vehicles, thus enabling easier maintenance. It features 4 hub electric motors to provide a four-wheel drive and is capable of traveling more than 250 miles (400 km) on a single charge.

German startup *ChargeX* specializes in modular electric vehicle charging solutions. It offers a modular EV charging solution that converts parking spaces into charging stations. The startup's platform, *Aqueduct*, is easy to install, has 4 charging modules with up to 22kW, provides monthly reports, and uses a Typ2 charging cable. The solution recognizes the power requirements of every car and automatically controls the charging speed for each vehicle.

Text 4. Shared Mobility

Source: <https://www.startus-insights.com/innovators-guide/automotive-industry-trends-10-innovations-that-will-impact-automotive-companies-in-2020-beyond/#trend-one>

With connected vehicles, new business models have come up that focus on shared mobility as an alternative to traditional vehicle ownership. This enables mobility-as-a-service (MaaS) and discourages unused vehicles. Such solutions meet the requirements of a city or a business without adding new vehicles, thus reducing waiting time for fleets and pollution caused by petrol or diesel vehicles.

The US-based startup *Launch Mobility* combines shared mobility solutions in a single platform. It develops a platform for a range of shared mobility solutions. The platform LM Mission Control™ offers free-floating or station-based car sharing, advanced shuttle services, shared dockless scooters, keyless rental programs, and peer-to-peer shared mobility. The LM Mission Control™ dashboard allows business users to manage their fleets. Further, their drivers use out-of-the-box or white-labeled apps to manage reservations or remotely access vehicles.

Singapore-based startup *Beam* develops electric scooters for urban mobility. It focuses on e-scooters to promote shared mobility in the Asia-Pacific region. Their scooters use an aviation-grade aluminum frame and are customized for sharing, safety, reliability, and durability. Users discover the nearest Beam scooter on the app and park it in visible public spots after the ride. Further, the micro-mobility platform offers a sustainable alternative to short-distance rides and helps regulate traffic flow in cities.

Text 5. Artificial Intelligence

Source: <https://www.startus-insights.com/innovators-guide/automotive-industry-trends-10-innovations-that-will-impact-automotive-companies-in-2020-beyond/#trend-one>

Artificial intelligence (AI) technologies such as machine learning, deep learning, and computer vision find applications in robotic automation within the automotive industry. These guide self-driving cars, manage fleets, assist drivers to improve safety, and improve services such as vehicle inspection or insurance. AI also finds applications in automotive manufacturing, where it accelerates the rate of production and reduces costs.

Indian startup *RevitsOne* offers an AI-powered fleet-management software that is suitable for fleets of varying sizes. The startup's vehicle management system provides insights into speed, running vitals, and health information. Drivers benefit from Voicera ID, a voice-based virtual assistant that helps them keep track of the information they need. Additionally, the onboard speed recorder limits the speed to discourage dangerous driving behaviors.

The US-based startup *Apex AI* offers an integrated automotive data management platform. Apex AI enables automotive companies to implement complex AI solutions. Apex.OS runs on automotive electronic control units (ECUs) and offers robust, reliable, and secure APIs to develop autonomous mobility solutions. ApexAutonomy offers modules to build 3D perception, localization, and control to enable autonomous vehicles. Lastly, MARV.Automotive is a configurable and extensible data management platform that reliably transmits data from the vehicle to the cloud.

Text 6. Big Data & Analytics

Source: <https://www.startus-insights.com/innovators-guide/automotive-industry-trends-10-innovations-that-will-impact-automotive-companies-in-2020-beyond/#trend-one>

The age of big data and advanced analytics informs various decisions throughout the lifecycle of a vehicle. Data gathered from vehicles enables predictive maintenance, informs managers about their fleets, and alerts concerned authorities in case of accidents. Moreover, customer automotive data finds applications in driving sales, optimizing supply chains, and enhancing product design for newer vehicles. Startups and emerging companies develop big data solutions to help automotive manufacturers, as well as ancillary industries, streamline their operations to maximize their margins.

The US-based startup *Procon Analytics* leverages big data to offer a solution for automotive finance. The solution captures millions of data points in real-time and analyzes them to enable lenders to instantly assess and reduce risk. This allows Buy Here Pay Here (BHPH) dealers to expand their businesses and extend credit to high-risk customers. Further, this also offers software solutions for fleet and asset tracking as well as connected cars.

Swiss startup *Unit8* uses big data and analytics to offer digital solutions for various industries. For the automobile sector, the startup develops predictive models that encourage car companies to improve marketing or operations and increase their revenue. These models provide insights into product build, price, as well as after-sales service.

Text 7. Human-Machine Interfaces

Source: <https://www.startus-insights.com/innovators-guide/automotive-industry-trends-10-innovations-that-will-impact-automotive-companies-in-2020-beyond/#trend-one>

As self-driving cars and connected cars transform the automotive landscape, it will fundamentally change how drivers interact with vehicles. Human-machine interfaces (HMI) use voice-based or haptic feedback to operate vehicles.

These expand the scope of how and what aspects of a car that a user may control. Consequently, such interfaces make the driving experience safer and more enjoyable.

Another form of HMI includes smart virtual assistants who help drivers and riders interact with the vehicles and other service providers.

The US-based startup *Awayr* creates advanced HMI solutions for connected cars and autonomous vehicles. Awayr develops human-machine interfaces for vehicles, unmanned aerial vehicles (UAVs), and robots. The startup works with automotive original equipment manufacturers (OEMs) to decrease HMI development cycle time and enhance the safety of interfaces.

Awayr also builds solutions to manage driver attention in unconventional situations, such as autonomous vehicles that may occasionally need human intervention.

German startup *Apostera* offers an advanced driver-assistance system (ADAS). The startup's platform combines augmented reality (AR), smart camera, and surround-view monitoring to illuminate the route on turns, curves, slopes as well as complex junctions. This assists the drivers in keeping lanes, prevents collisions, and enables autonomous driving options.

Moreover, the solution is customizable to any car model or specific OEM requirements.

Text 8. Blockchain

Source: <https://www.startus-insights.com/innovators-guide/automotive-industry-trends-10-innovations-that-will-impact-automotive-companies-in-2020-beyond/#trend-one>

Blockchain enables multiple applications in the automotive industry. These include sharing vehicle data over a secure network for connectivity and shared mobility solutions such as ride-hailing, urban transportation, and deliveries. Moreover, blockchain finds application in verifying the supply chain of spare parts or making sure that the raw materials and spare parts are sourced exclusively from legal and trusted sources.

British startup *Cube Intelligence* develops a blockchain-based security platform for autonomous vehicles. The startup's technology utilizes hash codes to block malicious attacks or hacking attempts on autonomous cars and connected cars. The hardware used gathers real-time data on mobility and emissions. Additionally, Cube Intelligence offers ride-hailing and valet parking services for AVs, as well as smart parking management systems.

Israeli startup *DAV* offers a decentralized autonomous vehicles platform based on blockchain technology. The platform allows autonomous vehicles to discover AVs, service providers, or clients around them. The vehicle-to-vehicle (V2V) communication is either on-blockchain, with smart contracts, or off-blockchain using DAV's protocols. The startup develops protocols for drone charging networks, drone flight planning, and open mobility.

Text 9. 3D Printing

Source: <https://www.startus-insights.com/innovators-guide/automotive-industry-trends-10-innovations-that-will-impact-automotive-companies-in-2020-beyond/#trend-one>

3D printing helps the automotive industry in three primary ways. Firstly, it enables rapid prototyping with 3D printed models that accelerate the design and testing phases of production. Secondly, it allows manufacturers to print spare parts to match their requirements. Lastly, additive manufacturing of composite materials leads to automotive parts that are lighter, stronger, and more durable.

Swiss startup *9T Labs* employs additive manufacturing to produce carbon composites for use in the automotive industry. The startup's design software *Fibrify* optimizes fiber placement and automates equipment production with additive fusion technology to mass-produce carbon fiber products. The 3D printed composites are more affordable, lightweight, dimensionally stable, corrosion-resistant, and also offer increased strength and stiffness.

Italian startup *Moi* combines thermosetting composite materials and 3D printing to manufacture high-performance parts for the automotive industry. Moi uses continuous fiber manufacturing (CFM) technology, robotic intelligence, and digital fabrication to deposit fibers. As a result, the solution is easily scalable for producing composites for panels, frames, and interior components. The startup also serves other industries, such as aerospace, construction, and biomedical.

Text 10. Internet of Things

Source: <https://www.startus-insights.com/innovators-guide/automotive-industry-trends-10-innovations-that-will-impact-automotive-companies-in-2020-beyond/#trend-one>

In the automotive industry, IoT enables secure communication between vehicles as well as vehicles and infrastructure components. The technology improves road safety, solves traffic congestion, and reduces pollution and energy expenditure with better fleet management. Startups and emerging companies develop advanced sensing technologies to

gather more data about the vehicle as well as allow the vehicle to understand its surroundings. The technology also automates payments for fuel and tolls.

Operating from Germany and the US, *EcoG* is a startup offering an IoT-based operating system and platform for Electric Vehicle (EV) charging. The startup provides manufacturers with tools that make the development and maintenance of EV charging infrastructure simple, fast, and scalable. It also allows operators to integrate services and microservices in the chargers to make the charging process profitable. In addition, the solution works with any EV charger and enables new features to be shipped throughout the network.

Canadian startup *KonnectShift* provides IoT solutions to optimize fleet and asset management. The startup develops *Konnect – GS01*, an automatic electronic logging device (ELD) to continuously track vehicular health. The solution includes route planning and optimization for real-time dispatch, advanced analytics to enable alerts regarding driving, vehicles, and fuel, predictive maintenance alerts to reduce downtime, as well as developing driver management apps.

Text 11. Magic Body Control and Electric Cars

Source: <https://www.pouted.com/top-10-latest-technologies-in-automotive-industry/>

Magic Body Control: It is one of the latest technologies of Mercedes-Benz which has been a leader in the automobile and vehicle spare parts industry. With an idea such as this, it is obvious that this company isn't prepared to give up its position in any way. This brand is known for its Active Body Control which it plans taking to a new level entirely through this innovation. A sensitive camera technology is what Magic Body Control entails. The road surface will be read and detected up to around 200 feet thereby making end-users have the perfect driving experience.

Electric cars: The popularity of non-renewable energy seems to be waning by the day. Also, experts have predicted that its reservoir will only decline with the passage of time. Given negative trends and developments such as these, there is a need for automobile companies to look beyond producing cars that make use of these sources of energy. This has given birth to the advent of electric cars.

As a proof that these cars are getting increasingly popular, their sales have been able to go above 10 million units which is a remarkable achievement. Brands such as VW, Daimler AG, and General Motors have started considering how to take advantage of this innovation by producing more electric cars.

Text 12. Improved Pricing and Driverless Technology

Source: <https://www.pouted.com/top-10-latest-technologies-in-automotive-industry/>

Improved Pricing: The advent of Blockchain technology is beginning to have some major effects on most industries all around the world. Automobile industry seems to be one of these as it has always struggled with issues related to counterfeit parts over the years. However, with the emergence of blockchain capabilities, this method has been solved in the best way possible. Not only have the overall strategies for pricing improved, but there has been transparency within the industry as well.

Driverless Technology: Companies in the automobile industry seem to be hitting new heights regarding the innovations daily. This is evident in the introduction of autonomous vehicles. The benefits that these vehicles do offer to users and owners are mouth-watering. For instance, there will be an effective management of traffic, better passenger comfort and a reduction in the rate of accidents. It is a technology that has been introduced to provide a higher level of safety for road users while driving from one place to another.

Text 13. Big Data Innovation and Predictive Maintenance

Source: <https://www.pouted.com/top-10-latest-technologies-in-automotive-industry/>

Big Data Innovation: Automobile industry doesn't want to be left out of the benefits that big data technology does offer. Major brands such as Toyota and Ford are making plans for designing cars with interconnected features in lots of ways. They want to get infotainment systems launched. This will provide a means through which the mobile phones that are making use of operating systems such as iOS and Android will be interconnected. The major idea behind big data innovation is to enable users from various platforms to communicate effectively. It is beginning to become a reality in the mobile industry.

Predictive Maintenance: A few years back, the repair and maintenance of cars were based on guesswork. Car owners don't know when their tires need to be repaired or replaced. This made some of them spend money unnecessarily. However, through the introduction of advanced self-diagnostic features, this problem is solved in the best way possible. Any time there is a problem with your vehicle, you get alerted. This will ensure that you carry out proactive measures to help your car be in the best condition. With a system such as this, your car will be able to serve you efficiently.

Text 14. Smart Cars and Protection of Data

Source: <https://www.pouted.com/top-10-latest-technologies-in-automotive-industry/>

Smart Cars: If you are thinking that you have seen the best of what the automobile industry can offer after using an electric vehicle, then you could be shocked by its introduction of smart cars. These cars are 100% data-driven and no doubt that they will offer users a better driving experience. Jaguar Land Rover seems to be one of the companies leading this technology at the moment which is based on usage of data. Although these cars make use of hardware, they are majorly dependent on software for optimal performances.

Protection of Data: This continues from the above technology about smart cars coming into existence. Given the fact that the use of data to store details is now beginning to become pronounced in the mobile industry, companies are introducing various technologies to ensure that users' data are protected. A proof of this was when General Motors experienced a cyber-attack and hackers took over a few vehicle functions. This has made companies be innovative about ensuring that such a challenge is handled in the best way possible.

Text 15. Distronic Technology and Teen Driver Technology

Source: <https://www.pouted.com/top-10-latest-technologies-in-automotive-industry/>

Distronic Technology: Mercedes Benz isn't resting on its laurels in any way as it tends to be bringing in some of the best innovations which the automobile industry has ever seen. The Distronic technology introduced ensures that car users and their passengers are comfortable while being held in traffic jams. Radar is what the functionality of this system is based on and it makes use of stereo camera technology (advanced). As soon as it gets activated or initialized, your Benz is going to be following the vehicle in your front. Your car will even have the ability to manipulate around bends all by itself.

Teen Driver Technology: It is always a nightmare handing over the keys of your car to a teenager. With sophisticated features integrated into some cars, you will not have to bother again. For instance, the Teen Driver feature of Chevrolet enables you to get alerted whenever a teenager has gone beyond a particular speed limit. Also, whenever seatbelts aren't made use of, the stereo will be disabled. There are lots of mouthwatering features which this technology does offer to ensure that teenagers are 100% safe while driving.

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. Прodelать 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 definitely 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 seems 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...

б) *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
<i>Подготовка</i>	Определение реальной ситуации, ее осмысление, рождение задачи (проблемы) из описания ситуации, постановка вопросов	Анализируют ситуацию, выявляют проблему, рассматривают актуальность ее решения
<i>Прогнозирование и целеполагание</i>	Прогноз изменения ситуации, постановка личностных и коллективных целей, их осознание	Обсуждают. Прогнозируют. Определяют цели
<i>Планирование</i>	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
<i>Реализация</i>	Сбор информации. Работа над проектом. Решение промежуточных задач. Получение запланированных результатов	Выполняют свою часть проекта. Промежуточное обсуждение хода реализации проекта
<i>Оформление и представление</i>	Формы представления устного и письменного отчета. Оппонирование	Отчитываются, обсуждают, представляют результаты для внедрения в практику
<i>Мониторинг и рефлексия</i>	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.

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