МИНИСТЕРСТВО СЕЛЬСКОГО ХОЗЯЙСТВА РФ

ФГБОУ ВО «БРЯНСКИЙ ГОСУДАРСТВЕННЫЙ
АГРАРНЫЙ УНИВЕРСИТЕТ»

ФАКУЛЬТЕТ СПО

ПОПОВА А.С.

ENGLISH FOR MECHANICAL ENGINEERS

учебно-методическое пособие

БРЯНСКАЯ ОБЛАСТЬ
2016

УДК 811(07)
ББК 81.2
П 58

Попова А.С. **ENGLISH FOR MECHANICAL ENGINEERS:** учебно-методическое пособие. / А.С. Попова. – Брянск: Издательство Брянский ГАУ. 2016. - 57 с.

Рецензент: преподаватель факультета СПО Брянского ГАУ Романеева В.В.

Рекомендована цикловой методической комиссией общеобразовательных, гуманитарных и социально – экономических, математических и общих естественнонаучных дисциплин от 26 сентября 2016 года протокол № 1.

ОБЩИЕ СВЕДЕНИЯ

Данное учебно-методическое пособие предназначено для студентов средних профессиональных учебных заведений, обучающихся по специальности 23.02.03 Техническое обслуживание и ремонт автомобильного транспорта и первых курсов высших учебных заведений сельскохозяйственного профиля.

Учебное пособие составлено в соответствии с требованиями ФГОС СОО и Примерной программой общеобразовательной дисциплины «Английский язык» для профессиональных образовательных организации направлено на формирование общих компетенций ОК 1-9. Пособие включает 8 разделов, каждый из которых содержит необходимый лексический минимум по теме, аутентичные тексты профессиональной направленности. Далее следует серия заданий, направленных на контроль понимания прочитанного материала и на отработку и закрепление тематической лексики при помощи упражнений, которые направлены на развитие навыков самостоятельного применения специфичных для конкретных ситуаций языковых явлений и словарного минимума по темам.

Данное учебно-методическое пособие может быть использовано как на аудиторных занятиях, так и для внеаудиторной самостоятельной работы.

UNIT 1
MECHANICAL ENGINEERING AS A FUTURE PROFESSION

Master the key terms and words:

engineering	инженерное дело, конструирование, машиностроение
mechanical engineer	инженер-механик, машиностроитель, инженер по механическому оборудованию
automotive engineering	автостроение, автомобильная техника
engineering solutions	техническое, инженерное решение
an automobile	легковой автомобиль, машина
a vehicle	автотранспортное средство, любое средство передвижения
machinery	механическое, машинное оборудование
dynamics	динамика, динамические характеристики
statics	статика, электростатические явления
hydraulics	гидравлика, гидравлическая система
strength of materials	сопротивление материалов
kinematics	кинематика, кинематическая схема
applied thermodynamics	прикладная термодинамика
mechanism	механизм, механическое воздействие
efficiency	эффективность, уровень качества

1. Read the following text.

Engineering as said in the dictionary is

1. The practical application of scientific knowledge in the design, building and control of machines, roads, bridges, electrical apparatus, chemicals;

2. The work, science or profession of an engineer.

The primary types of engineering are chemical, civil, electrical, industrial, and mechanical.

We will study thoroughly mechanical engineering. Mechanical engineering is the application of physical principles to the creation of useful devices, objects and machines. Mechanical engineers use principles such as heat, force, and the conservation of mass and energy to analyze static and dynamic physical systems, in contributing to the design of things such as automobiles, aircraft, and other vehicles, heating and cooling systems, household appliances, industrial equipment and machinery, weapons systems, etc.

Fundamental subjects of mechanical engineering include: dynamics, statics, strength of materials, hydraulics, kinematics, and applied thermodynamics. Mechanical engineers should understand and be able to apply concepts from the chemistry and electrical engineering fields.

Engineers in this field design, test, build, and operate machinery of all types; they also work on a variety of manufactured goods and certain kinds of structures. The field is divided into machinery, mechanisms, materials, hydraulics, and pneumatics; and heat as applied to engines, work and energy, heating, ventilating, and air conditioning. The mechanical engineer, therefore, must be trained in mechanics, hydraulics, and thermodynamics and must know such subjects as metallurgy and machine design. Some mechanical engineers specialize in particular types of machines such as pumps or steam turbines. A mechanical engineer designs not only the machines that make products but the products themselves, and

must design for both economy and efficiency. A typical example of modern mechanical engineering is the design of a car or an agricultural machine. One of the subtypes of mechanical engineering is automotive engineering. The automobile was invented in the late 1800's and did not come prominence until the early 20th century. Its basic configuration was determined and mass-production methods were established.

It becomes available to a society. The automobile vastly expanded most people's mobility horizons. It enabled profound changes in most aspects of modern life. New roads were built to support the automobile. But as there are many advantages so disadvantages of the car invention also exist. It includes air pollution and car accidents. But all this fostered new engineering solutions to improve the quality of the human condition.

2. Choose from the text and put down the English equivalents to the Russian word combinations given below:

сельскохозяйственная машина- _____
применение научных знаний- _____
создание полезных приборов- _____
основные дисциплины - _____
промышленные изделия- _____
паровые турбины- _____
загрязнение воздуха- _____
электрические приборы- _____
система подогрева и охлаждения- _____
промышленное оборудование- _____
серийное производство- _____
дорожно-транспортное происшествие- _____

3. Complete the sentences with given verbs:

operate - use - specialize - design - divided - work - study

1. We will.. .thoroughly mechanical engineering.

2.Mechanical engineers...principles such as heat, force.

3. Engineers in this field..., and... machinery of all types.

4. They also...on a variety of manufactured goods.

5. The field is.. .into machinery, mechanisms, materials, hydraulics.

6. Some of them.. .in particular types of machines.

4. Answer the following questions:

1. What is engineering?

2. What types of engineering do you know?

3. Why do mechanical engineers use such principles as heat, force, and the conservation of mass and energy?

4. What subjects must the mechanical engineer be trained in?

5. Are there any disadvantages of the car invention?

UNIT 2
AUTOMOTIVE ENGINEERING

Vocabulary to use:

incorporate	Включать
software	программное обеспечение
safety engineering	техника безопасности
involve	Вовлекать
separate	Разделять
stream	Направление
determine	Определять
delivery	Поставка
responsible	Ответственный
evaluation	Оценка

conduct	Проводить
level	Уровень
interaction	Взаимодействие
interference	Помеха
handle	Решать
team	Команда
powertrain	Трансмиссия
exterior	Внешний
interior	Внутренний

Read the text

Automotive engineering is a branch of Vehicle engineering. It incorporates elements of mechanical, electrical, electronic, software and safety engineering as applied to the design, manufacture and operation of automobiles, buses and trucks and engineering subsystems.

Automotive engineers are involved in almost every aspect of designing cars and trucks. Broadly speaking automotive engineers are separated into three main streams: product engineering, development engineering and manufacturing engineering.

- Product engineer (also called design engineer), that would design components/systems (i.e. brake engineer and battery engineer).
- Development engineer, that engineers the attributes of the automobile.
- Manufacturing engineer determines how to make it.

A Development Engineer is a job function within Automotive Engineering, in which the development engineer has the responsibility for coordinating delivery of the engineering attributes of a complete automobile (bus, car, truck, etc.).

The Development Engineer is also responsible for

organising automobile level testing, validation, and certification. Components and systems are designed and tested individually by the Product Engineer. The final evaluation though, has to be conducted at the automobile level to evaluate system to system interactions. As an example, the audio system (radio) needs to be evaluated at the automobile level. Interaction with other electronic components can cause interference.

The design of modern cars is typically handled by a large team of designers and engineers from many different disciplines. As part of the product development effort the team of designers will work closely with teams of design engineers responsible for all aspects of the vehicle. These engineering teams include: chassis, body and trim, powertrain, electrical and production. The design team under the leadership of the design director will typically comprise of an exterior designer, an interior designer (usually referred to as stylists), and a color and materials designer. A few other designers will be involved in detail design of both exterior and interior.

1. Match the beginning of the sentence with its end.

1. Components and systems	a. will be involved in detail design of both exterior and interior
2. Other designers	b. are involved in designing cars and trucks
3. Automotive engineering	c. is typically handled by a large team of designers.
4. Automotive engineers	d. are designed and tested by the Product Engineer.
5. The design of modern cars	e. is a branch of Vehicle engineering.

2. Match the words to their definitions.

1. Manufacturing engineer	a. is responsible for organizing automobile testing, certification.
2. Product engineer	b. determines how to make the automobile.
3. Development engineer	c. is involved in automobile designing and testing.

3. In pairs, ask and answer the following questions:

1. What three main streams are automotive engineers separated into?
2. What does automotive engineering incorporate?
3. Are manufacturing engineers responsible for organising automobile level testing and certification?
4. What is typically handled by a large team of designers and engineers from many different disciplines?

UNIT 3
AUTOMOBILE PRODUCTION

1. **Match the English combinations with the corresponding Russian ones:**

1. mechanical engineer	a. долгий срок службы
2. to deal (with)	b. запустить в массовое производство
3. designing cars	c. подвергать испытаниям
4. to put into mass production	d. плавное сцепление
5. long service life	e. отвечать современным требованиям

6. driving safety	f. иметь дело (с кем-л., чем-л.)
7. to meet up-to-date demands	g- надежные тормоза и рулевое управление
8. smooth-acting clutch	h. безопасность езды (вождения)
9. silent gearbox	i. бесшумная коробка передач
10. dependable brakes and steering system	j- инженер-механик
11. to subject to tests	k. конструирование автомобилей

2. **Read the text.**

Specialists in automobile industry deal with designing and manufacturing cars, so they should know that the production of the automobile comprises the following phases:

1) Designing,
2) Working out the technology of manufacturing processes,
3) Laboratory tests,
4) Road tests,
5) Mass production (manufacturing).

Why is it necessary to know all these facts?

It is important to know them as before the automobile (car or truck) is put into mass production, it should be properly designed and the automobile must meet up-to-date requirements.

What are these requirements?

The automobile must have high efficiency, long service life, driving safety, ease of maintenance and pleasant appearance.

In order to obtain all these qualities engineers should develop up-to-date methods of designing cars, using new types of resistant to corrosion light materials. Also it is important to know computer science because it is intended to shorten the

time between designing and manufacturing. Computers offer quick and optimal solutions of problems.

But before the car is put into mass production all its units and mechanisms are tested, first in the plant's laboratory, then the car undergoes a rigid quality control in road tests. Only then the car is put into mass production. Why are these tests required? What qualities are required of the automobile? The modem automobile must be rapid in acceleration, must have smooth acting clutch, silent gearbox, dependable brakes and steering system, as well as pleasant appearance. Also it must be comfortable and have all conveniences.

3. **Find the answers to the following questions. Write down the questions in the order they are asked.**

1. Why is it important for the specialists in automobile industry to know computing methods?	a. It must have high efficiency, long service lite, driving safety, ease of maintenance and pleasant appearance.
2. What qualities are required of the automobile?	b. They should be able to develop up-to-date methods of designing cars and shorten the time between designing and manufacturing.
3.Why are cars subjected to road tests?	c. Because they must meet up-to-date requirements.
4. What requirements must the automobile meet?	d. Designing, working out technological processes, laboratory and road tests, mass production.
5. What phases does the production of the automobile comprise?	e. It must be rapid in acceleration, must have smooth acting clutch, silent gearbox, dependable brakes and steering system.

4. **Complete the sentences using the information from the text:**

1. The cars are subjected to road tests in order...
2. The car must have the following units...
3. The car must have the following qualities...
4. The production of the automobile comprises the following phases...
5. Engineers should develop up-to-date methods of...

JUST FOR FUN

Read the text and fill in the gaps with the words from the list:

Retake;Underestimated;Useless; Backwards; examiner; overcrowded\crowded; luckily; disappointed; unfriendly; conductor; disbelief

The driving test

I knew I would have to 1) ... my driving test as soon as 1 saw the 2) ... . He didn't even say "hello" and seemed very 3) .... I was a little bit late I suppose as I had slightly 4) ... how long it would take me to get there. As usual in this 5) ... city all the buses were packed and I had had to wait more than twenty minutes before a 6) ... would let me get on a bus. 1 knew apologizing would be 7) ... so I just got in the car. 8) ... I wasn't feeling particularly nervous but this horrible man stared at me in 9) ... as I began to drive off. T put the car into gear, but it went 10)... so fast I couldn't believe it-straight into the wall. I was so 11) ... when he told me I had failed that I thought I might cry.

UNIT 4. MECHANICS OF MATERIALS. BASIC PRINCIPLES

1. Scan the texts and find English equivalents for the following words:

Твердое тело, ось, сопротивление материалов, внешняя сила, равновесие, внутренняя сила, статика, осевое (продольное) напряжение, деформация, нагрузка, сопротивление, жесткость, прочность, способность выдерживать нагрузку, план- функция, международная система единиц, циклическое нагружение, сосредоточенная нагрузка, ударная нагрузка, статическая нагрузка.

BASIC PRINCIPLES

Mechanics of materials is the branch of applied mechanics that deals with the internal behavior of variously loaded solid bodies. The "solid bodies" referred to include shafts, bars, beams, and columns, as well as structures and machines that are assemblies of these components. Also called strength of materials or mechanics of deformable bodies, mechanics of materials focuses primarily on stress analysis and on the mechanical properties of materials.

The study of mechanics of materials is based upon an understanding of the equilibrium of bodies under the action of forces. While statics treats the external behavior of bodies that are ideally rigid and at rest, mechanics of materials is concerned with the relationships between external loads and internal forces and deformations induced in the body. Stress and strain are fundamental quantities connected with them.

Complete analysis of a structure under load requires the determination: stress, strain, and deformation through the use of three fundamental principles: the laws of forces, the laws of material deformation, and the conditions of geometric

compatibility.

Investigation of the behavior of solids under loads began with Galileo Galilei (15641642), though Robert Hooke (1635-1703) was the first to point out that a body is deformed if a force acts upon it. Since then many engineers, scientists, and mathematicians in the field of stress analysis have developed the basic knowledge on which modern methods are based, and the literature related to the strength of materials is voluminous.

FORCE AND LOAD CLASSIFICATIONS

All forces acting on a body, including, the reactive forces caused by supports, are considered external forces. These forces are classified as surface forces and body forces. A surface force is of concentrated type when it acts at a point, but it may also be distributed over a finite area. A body force acts on a volumetric element rather than on a surface and is attributable to fields such as gravity and magnetism. The force of the earth on an object at or near the surface is termed the weight of the object. Internal forces in a body can be considered as forces of interaction between the constituent material particles of the body.

The loads on bodies may be concentrated and distributed forces. Any force applied to an area is a concentrated load. A load slowly and steadily applied is regarded as a static load, while a rapidly applied load is called an impact load.

In the International System of Units, force is measured in newtons (N), but because the newton is a small quantity, the kilonewton (kN) is often used in practice. In the U.S. Customary System, force is expressed in pounds (lb) or kilopounds (kip).

SCOPE OF TREATMENT

The usual objective of mechanics of materials is the examination of the load carrying capacity of a body from three standpoints: strength, stiffness, and stability. These qualities relate to the ability of a member to resist permanent deformation or fracture, to resist deflection, and to retain its equilibrium configuration. The stress level, sometimes expressed through failure theories which relates to the complex stresses in a structure with the experimentally obtained axial stress, is used as a measure of strength. Failure can be defined, in very general terms, as any action that results in an inability on the part of the structure to function in the manner intended.

The main concerns in the study of mechanics of materials may be summarized as follows:

1. Analysis of stress and deformation within a loaded body, which is accomplished by application of one of the methods.

2. Determination by analysis (or by experiment) of the largest load a structure can sustain without suffering damage, failure, or compromise of function.

3. Determination of the body shape and selection of those materials which are most efficient for resisting a prescribed system of forces under specified environmental conditions of operation. This is called the design function.

The ever-increasing demand for more sophisticated structural and machine components calls for the concepts of stress and strain and of the behavior of materials.

2. Fill in the gaps with the words and right prepositions from the texts:

1. A surface force is ... concentrated type when it acts ... a point, but it may also be distributed ... a finite area.

2. The design function is determination ... the body shape and selection ... those materials which are most efficient ... resisting a prescribed system ... forces ... specified environmental conditions ... operation.

3. The study ... mechanics ... materials is based ... an understanding ... the equilibrium ... bodies ... the action ... forces.

4. ... the International System of Units force is measured ... newtons.

5. Mechanics ... materials focuses primarily ... stress analysis and ... the mechanical properties ... materials.

3. **Read the texts once again and answer the questions:**

1. What is mechanics of materials?
2. Give some examples of the solid bodies.
3. What are the fundamental quantities of mechanics of materials?
4. What is a surface force and body force?
5. What are three standpoints of the load carrying capacity of a body?
6. How can you characterize a failure?

4. **Complete the sentences using the information from the text:**

1. The usual objective of mechanics of materials is ...
2. The loads on bodies may be ...
3. Investigation of the behavior of solids under loads began with ...
4. Failure can be defined as ...
5. Mechanics of materials is the branch of...
6. Statics treats...

UNIT 5.
APPLIED MECHANICS

1. Match the English terms with the corresponding Russian ones:

1. applied mechanics	a. применять
2. a rigid body	b. частица
3. negligible	c. отношение
4. constant	d. условие
5. dimensions	e. законы механики
6. quantities	f. движение
7. scale	g. величины
8. particle	h. масштаб, размер
9. to apply	i. незначительный
10. laws of mechanics	j. теоретическая механика
1 1 .relation	к. размеры
12. motion	l. постоянный
13. condition	т. твердое тело

Read the text

Mechanics is a branch of physical science which considers the effect of forces upon the motion or upon the conditions of material bodies.

Applied mechanics is a part of mechanics. It includes the laws of mechanics to be applied to the motions of particles and of rigid bodies as used in problems of engineering. The condition of rest is considered to be the limiting condition of motion.

A particle is a body or a part of a body the dimensions of which are small and negligible when it is compared with its surroundings or with its range of motion, so that the force acting upon it may be localized at a point.

The subject of applied mechanics may be divided into two parts statics and dynamics, and dynamics may be further divided into kinematics and kinetics. It is statics that treats bodies in equilibrium, and dynamics that treats the particles and bodies in motion. Kinematics is the part of dynamics to treat the motion of particles and rigid bodies without reference to the forces that produce or change the motion. Kinetics is the part of dynamics to treat the motion of material bodies which are changed by the application of forces. In order to understand thoroughly such a subject as applied mechanics, it is necessary for the student to solve a number of problems.

There are three common methods of analysis of problems: the graphic method, the trigonometric method and the algebraic one. In the graphic method, the quantities are represented by corresponding lines or areas; the relations between them are represented by the relations of the parts of the diagram.

In the trigonometric method, the quantities are represented by lines or areas as well but they are not necessarily drawn to scale.

In the algebraic method, quantities are represented by symbols; the relations between them are shown by signs indicating the operations; and the solution of the resulting equations is made by algebra.

2. Complete the sentences with one possible answer:

1. Mechanics is a branch of physical science which considers ...

b) the effect of radiation upon people and animals.

c) the effect of forces upon the motion or upon the conditions of material bodies.

d) the forms of transformation of energy connected with the movement of material systems under the action of force factor.

2. ... the quantities are to be represented by corresponding lines or areas; the relations between them are to be represented by the relations of the parts of the diagram.

a) In the algebraic method ...
b) In the graphic method ...
c) In the trigonometric method ...

3. ... is the part of dynamics to treat the motion of material bodies which are changed

by the application of forces

a) Kinetics
b) Kinematics
c) Statics

3. Insert the preposition wherever necessary:

1. Applied mechanics may be divided ... two parts statics and dynamics.

2. Statics treats ... bodies ... equilibrium.

3. A problem ... mechanics consists ... a statement ... certain known quantities and relations ... which certain other unknown quantities or relations are to be determined.

4.... the trigonometric method, the quantities are to be represented ... lines or areas.

5. Understanding ... applied mechanics depends ... the ability ... students to solve a number... problems

UNIT 6
PROPERTIES OF METALS AND THEIR USES

Vocabulary to use:

alloy	Сплав
steel	Сталь
strength	Прочность
ferrous nonferrous	Черный Цветной
toughness	Жесткость
bending	сгиб
softness	мягкость, пластичность
rusting	Коррозия
oxidation	Окисление
sharp melting point	четкая точка плавления
coefficient of expansion	коэффициент расширения
breadth	ширина, степень, объем
thickness	Плотность
specific Gravity	удельный вес (масса)
specific density	удельная плотность
electrical resistance	электрическое сопротивление
mechanical properties	механические свойства
sheathing	Обмотка
tensile strength	предел прочности, прочность на растяжение
compressive strength	прочность на сжатие
ductility	Ковкость

Read the text

The selection of the proper metal or alloy for a given use is an important part of the practice of metallurgy. Because iron and steel are used in larger quantities than any of the other metals, it is common practice to divide materials into ferrous and nonferrous.

- Strength, ease of shaping and relatively low cost are of greatest importance for major structural purposes. For these purposes steel is ideally suited. For automobile parts, and wherever greater strength and toughness are required, more expensive special steels are used.

- Metals light in w[r]eight - For making different machine parts, and in other applications where strength must be combined with light weight, metals such as aluminum or magnesium and their alloys are used.

- Softness. Ease in bending - For uses requiring softness and ease in bending, as in cable-sheathing and where certain chemical properties are needed, lead and its alloys may be employed.

- Susceptibility to corrosion - Metals vary greatly in their susceptibility to atmospheric and chemical corrosion. The rusting of iron is the commonest example. - Oxidation or corrosion of those metals takes place at ordinary temperatures. Such metals as sodium, magnesium, zinc, iron, nickel, lead are difficult to obtain free in nature as they unite readily with other elements. And such metals as hydrogen, silver, copper and gold are found free in nature because they combine with other elements with difficulty. They do not corrode and are not easily oxidized.

- Melting Point - The melting point is the temperature at which a substance passes from a solid to a liquid condition. Pure substances have a sharp melting point, that is, they pass from entirely solid to entirely liquid form in a very small temperature range. Alloys usually melt over a much wider

temperature interval.

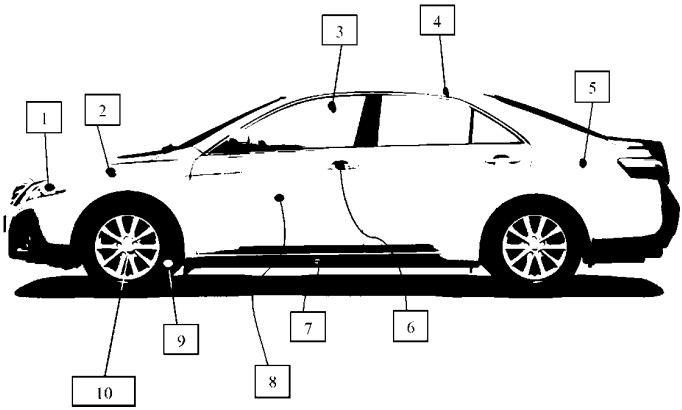
- Coefficient of expansion - With few exceptions, solids expand when they are heated and contract when cooled. They increase not only in length but also in breadth and thickness. The number of factors that shows the actual increase in unit length of a solid when it is heated one degree is called its "coefficient of expansion'[1].

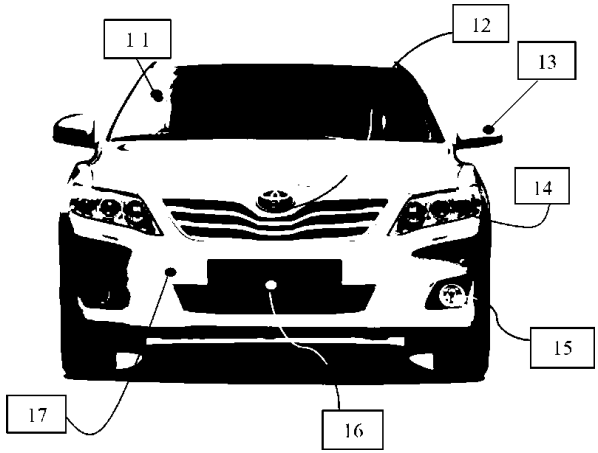
- Specific Gravity - Sometimes it is an advantage to compare the density of one metal with that of another. For such a purpose, we need a standard. Water is a standard that physicists have selected with which to compare densities of solids and liquids. The weight of a substance compared to the weight of an equal volume of water is called its specific density or specific gravity.

- Electrical resistance - The opposition to electric current as it flow[T]s through a wire is known as the resistance of the wire.

- Mechanical properties - Generally we are very much concerned with the mechanical properties of metals and alloys. The mechanical properties, such as hardness, tensile strength, compressive strength, and ductility are those measured by mechanical methods.

1. Label the parts of the car.





Roof - wing - indicator - fog light - side window - front bumper - number plate - logo - petrol flap - door handle - sill – door – headlight - tyre - wheel trim - front bumper – windscreen - wing mirror

2. Complete the sentences about materials and their properties with the following words:

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

a. Wood is very often used in interiors because it looks ... and warm.

b. Aluminum and magnesium are important in car manufacturing because they are ... and therefore good for weight-saving.

c. Rubber should be able to withstand great temperature differences while staying... In other words, it shouldn't become brittle.

d. Windscreens are made of special ... glass to protect drivers in accidents.

e. Fabrics used in cars need to be ... and not look old too quickly.

f. Steel is used for load-bearing parts because it is ... ,

g. Sheet metal is used for large car parts because it is… and dent-resistant.

h. Aluminum is ideal for bumpers and other body parts because it is ... .

JUST FOR FUN

Read the text and fill in the gaps with the words from the list:

Ignition; accelerator pedal; gear; dashboard; brake; clutch pedal; rear view mirror; seatbelt

The first time I drove after passing my driving test, I was determined to get everything right. Got into the car, turned the key in the 1) ... and put my foot on the 2) ... while changing into first 3) ... .

Slowly I pressed down on the 4) ... and pulled out into the road. Driving along, I remembered to look at the petrol gauge on the 5) ... to make sure I had enough petrol. Suddenly, a flashing light in the 6) ... caught my eye. There was a police car behind indicating that I should pull over, so I gently pressed on the 7) ... and stopped. Winding down the window, I asked the policeman what was wrong - I had thought I was doing so well! His answer was very embarrassing: "You've forgotten to put on your 8) … “

UNIT 7
THE HISTORY OF THE AUTOMOBILE
WHERE DOES THE WORD "AUTOMOBILE" COME FROM?

1. **Before you read the text try to guess the answer to the following question:**

consist of	состоять из
self-moving	самодвижущийся, самоходный
arise from	обуславливаться
unprovided	необеспеченный
rails	железнодорожные пути
substantially	значительно
adapt for	приспособить
cease	перестать
luxury	роскошь
decisive factor	решающий фактор
solution	решение
development	развитие
road maintenance	содержание дорог
improvement	усовершенствование

The word automobile is not English. It consists of two words: autos and mobilis. Autos is a Greek word meaning “self ”, mobilis — a Latin word meaning "movable". The two words taken together mean "self-moving". Thus, an automobile means a self-moving vehicle. The synonyms of automobile are: auto, car, auto-car, motor car.

The role and importance of an automobile arise from the fact that it can move along roads unprovided with rails. In this respect, it substantially differs from a street car (tram) and a

railway car (train). In fact, it often replaces street cars, railway cars, and other agencies of transportation and communication. In short, the automobile is a vehicle well adapted for ordinary road conditions.

The automobile has long since ceased to be a matter of luxury or sport and has become a decisive factor in the economic development of many countries. This accounts for the fact that the world at large uses a great number of automobiles. In some countries where automobiles are found in millions they are playing a most important part in the solution of many problems of transport.

The development of automobiles is also accountable to a large extent for the progress in road maintenance, improvement and construction.

2. Answer the questions:

1. What is the original of the word automobile?
2. What fact does the role and importance of the automobile arise from?
3. Why does the automobile play an important part in the economic development in many countries?

THE EARLY DAYS OF THE AUTOMOBILE

1. Scan the text and find the names of famous scientists and their inventions:

achievement	достижение
single	один
attempt	попытка
mechanical power	механическая энергия
propel	приводить в движение

suggest	предлагать
military engineer	военный инженер
steam-driven encine	паровой двигатель
three-wheeled carriage	трехколесный экипаж
brake	тормоз
gearbox	коробка передан
opposition	сопротивление
lag	отставать
restriction	ограничение
legislative act	законодательный акт
outlaw'	запрещать
editor	редактор
issue	издавать, выпускать
appear	появляться
escort	сопровождать
prosecute	обвинять

Like most other great human achievements, the motor car is not the product of any single inventor.

One of the earliest attempts to propel a vehicle by mechanical power was suggested by Isaac Newton. But the first self-propelled vehicle was constructed by the French military engineer Cugnot in 1763. He built a steam-driven engine which had three wheels, carried two passengers and ran at maximum speed of four miles per hour.

In 1784 the Russian inventor Kulibin built a three-wheeled carriage.

In his vehicle he used for the first time such new elements as brakes, rollers and a gearbox.

In 1825 a steam engine was built in Great Britain. The vehicle carried 18 passengers and covered 8 miles in 45 minutes. However, the progress of motor cars met with great

opposition in Great Britain. Further development of motor car lagged because of the restrictions resulting from legislative acts. The most famous of these acts was the Red Flag Act of 1865, according to which the speed of the steam-driven vehicles was limited to 4 miles per hour and a man with a red flag had to walk in front of it.

In Russia there were cities where motor cars were outlawed altogether. When the editor of the local newspaper in the city of Uralsk bought a car, the governor issued these instructions to the police: "When the vehicle appears in the streets, it is to be stopped and escorted to the police station, where its driver is to be prosecuted."

2. Fill in the gaps with the words from the text and translate the sentences into Russian:

1. Like most other great human, the motor car is not the product of ... .

2. In his vehicle Kulibin used for the first time such new elements as ..., ... and ….

3. The progress of motor cars... in Great Britain.

4. The speed of the steam-driven vehicles was... to 4 miles per hour and a man with a red flag ... front of it.

5. In Russia there were cities where ... were outlawed altogether.

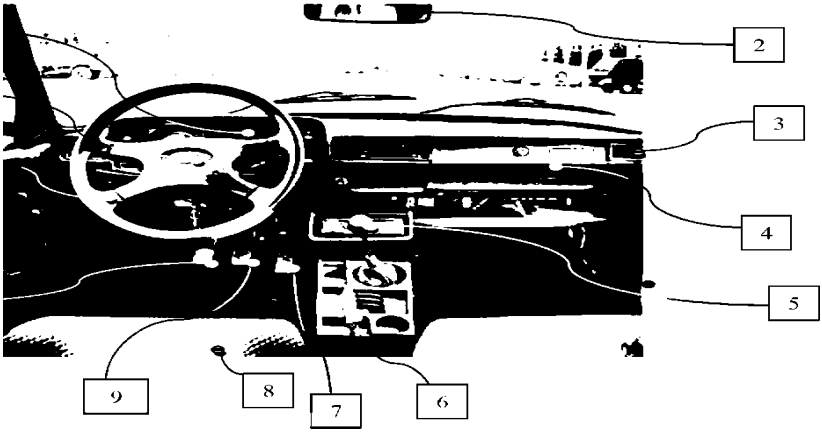
3.Answer the questions:

1. Is the motor car a product of a single inventor?

2.When was the first self-propelled vehicle constructed?

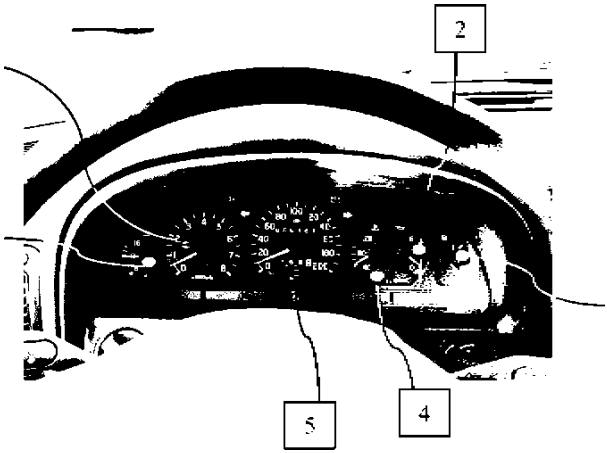
3.Did the progress of motor cars meet with great opposition?

6. Label the parts of a car interior.



steering wheel; real-view mirror; handbrake; car seat; brake pedal; glove compartment; horn; dashboard; gear stick; air vent; clutch pedal; accelerator.

4. Match the numbers with the names of the instruments.



• engine oil pressure gauge • rev counter • coolant temperature gauge • fuel gauge • speedometer • voltmeter

JUST FOR FUN

Read the following news report and fill in the correct words from the list:

Braked; damaged; injuries; overtake; direction; skidded; Crashed; Collision

"... There have been further road accidents following yesterday's heavy rain. Early last night two motorists suffered serious 1) ... in an incident involving three vehicles.

Mr. Ray Amberly from Newden was traveling along Руке Road at around 90 mph when he noticed the van behind his car winch was driven by Mr. Joseph Brown, moving out to 2) ... him. Mr. Amberly 3) ... slightly in order to let the driver of the van pass, but instead of slowing down, his car 4) ... on the slippery surface and 5) ... into the van. As a result, the van was knocked into the third vehicle, which was coming from the other 6) ... .It was driven by Mr. Luke Porter. All three vehicles were severely 7) ... in the 8) ... and the three drivers had to be taken to hospital.

Police believe that the crash could have been avoided if the drivers had not been so fast under such dangerous conditions."

UNIT 8
CAR INDUSTRY AND ENVIRONMENT.
CARS: PASSION OR PROBLEM?

Vocabulary to use:

convenience	удобство
exciting	увлекательный
valuable	ценный
produce	выпускать
available	доступный
entertainment	развлечение
advertising	реклама
cellular phone	сотовый телес зон
dozen	десяток-
traffic	уличное движение
average speed	средняя скорость
crowd	заполнять
freeway	скоростная автомагистраль (без платы за проезд)
environmentalist	специалист по охране окружающей среды
fuel	топливо
protect	защищать
gasoline	бензин
parking lot	стоянка для автомобилей
available	доступный
believe	считать
require	нуждаться
pollute	загрязнять
flight	полет
solar-powered	работающий на солнечной энергии

1. Read the first paragraph of this text. Predict what the rest of the reading will be about, using the choices below. You can circle more than one answer. Then continue reading it.

1. the convenience of cars
2. the excitement of cars
3. the development of cars
4. the danger of cars

For some people, the car is a convenient form of transportation. But for others, the car is an exciting hobby. Some people spend their lives collecting valuable cars. Others drive them in races, including the Mille Miglia in Italy, the Carrera Panamericana in Mexico, and the world-famous Indianapolis 500. For many people, cars are more than transportation. They are a source of passion and pleasure. Yet cars can also be a source of many problems.

In 1903, Henry Ford began selling the Model T car for $825. His company, Ford Motors, was the first to produce cars in large numbers. This made the car available to large numbers of people and helped them to travel long distances quickly and easily. The car has brought people much closer to places of work, study and entertainment.

Many people also work in car-related industries: fixing cars, washing cars, advertising cars and selling car products such as stereos and cellular phones.

Most Americans buy a new car every five or six years. This means that one American may own a dozen cars in a lifetime. In fact, there are more cars than people in the United Slates. In New York City, 2.5 million cars move in and out of the city each day. In this traffic, the average speed is sometimes 8.1 miles per hour. This speed could easily be reached by riding a horse instead of driving a car. But New Yorkers continue to drive, just as people do in California, where freeways are often very crowded.

Some environmentalists believe that forms of public transportation such as buses and trains have not been fully developed in the United States. They try to teach others that public transportation saves fuel and helps to protect the environment. Many people are unhappy with car traffic and pollution, as well as with the use of beautiful land for building new roads. One environmentalist, Jan Lundberg, left his Mercedes-Benz in Los Angeles and moved to the forests of northern California. There he works on the Auto-Free Times, a newspaper that teaches people how to live without driving. Lundberg travels on foot, on bicycle, or by bus. Before he decided to live without a car, Lundberg worked for the oil companies, studying the prices of gasoline.

Lundberg and other environmentalists dream of turning parking lots into parks and replacing cars with bicycles, but most people around the world believe that the car is a necessary part of life in today's world. Still, there is an important question that must be answered: What kind of fuel will we use when gasoline is no longer available? Lundberg believes that by the 2021, there will no longer be oil for gasoline makers to use. To solve this problem, car companies in Korea, Japan, Europe, and the United States are trying to develop an electric car that will not require gasoline at all.

The electric car is not a new idea. It had success with American women in the early 1900s.

Women liked electric cars because they were quiet and did not pollute the air. Electric cars were also easier to start than gasoline-powered ones. But gasoline- powered cars were faster, and in the 1920s they became much more popular.

The electric car was not used again until the 1970s, when there w[r]ere serious problems with the availability of oil. Car companies began to plan for a future without gasoline. The General Motors Company had plans to develop an electric car by 1980; however, oil became available again, and this car was

never produced.

Today there is a new interest in the electric car, which is partly related to a passion for speed and new technology. In 1977, engineer Paul MacCready, designed a human-powered airplane that successfully completed a three-mile flight. A similar airplane crossed the English Channel in 1977, followed by a solar-powered airplane. In 1987, the Sunraycer, a solar-powered car, won a 2,000-mile race in Australia. As a result of this success, the General Motors Company began new[r] work on the development of the electric car. The Toyota Company recently decided to spend $800 million a year on the development of new car technology. Many engineers believe that the electric car will lead to other forms of technology being used for transportation.

Cars may change, but their importance will not. Cars are important to nearly everyone, including engineers, businesspeople, environmentalists, and even poets. Poet Curt Brown believes that cars are part of our passion for new places and new experiences. According to Brown, this "very, very comfortable flying chair" will continue to bring us travel and adventure, no matter how it changes in the future.

2. Number the following main ideas in the order they appear in the text:

a. Soon there will be no oil to fuel cars.

b. Cars, whether gasoline or electric powered, will always be important.

c. Cars can cause problems.

d. To some people, cars are more than transportation.

e. Some environmentalists teach people how to live without cars.

f. People in the U.S. need cars to go to school, to work, and to places of entertainment.

2. Complete the following lists with information from the text:

Advantages of the car:
1. Some people enjoy _____
2. People can travel _____
3. People are closer to _____
4. Some people make money by _____

Disadvantages of the car:
1. Lots of traffic and _____
2. Cars use more fuel than _____
3. Beautiful land is replaced with _____
4. Gasoline may no longer _____

UNIT 9
PLANNING FOR AN ENVIRONMENT-FRIENDY CAR

1. An environmentalist is someone who works to protect the environment: the air, land and oceans of the Earth. Read the article below. It describes a meeting of environmentalists who want to prepare for the future with fewer cars. Replace the underlined words and phrases with the words printed above the text.

Available convenient develop engineers fuel
Industries passion source technology valuable

At a recent meeting of environmentalists, the problem of cars was discussed. Most environmentalists believe that in the future, there will be no more oil. This means that there will be no more gasoline for the cars that so many of us drive every day.

The environmentalists agreed that cars have made our lives much easier and more comfortable. But they believe that it is very important for the people who are working on machines to try and build new ones that will not require gasoline.

"We have always been good at using science to create new machines", said one environmentalist. "This is very important. Our ability to build and create new forms of transportation will help us face a future without gasoline."

The environmentalists also discussed the importance of working with businesses to help them prepare for the future. "A world without gasoline means a world with fewer cars, added one man." And this is good because it means less pollution. Maybe companies could find a way to pay extra money to workers who take buses or ride bicycles to work."

Most of the people at the meeting described their deep love for the Earth and their desire to keep it clean. They want to power cars by using solar or electric power as the place where energy comes from. Both of these create less pollution than gasoline, and they will continue to be usable in the future.

2. What ideas did the environmentalists discuss at the meeting?

3. Environmental awareness will become increasingly important in the future. How environmentally-conscious are you?

Which students in the class do you think would answer "yes" to the following statements? Ask them and see if you were right.

1. Fuel should be highly taxed.
2. I always find out if my car has been manufactured in a plant with an eco-audit.
3. I consider the car's recyclability when I decide which new car to buy.

4. Introducing a speed limit on roads is a good idea.

5. A car's fuel consumption is a key priority when I buy a car.

4. Read and translate the phrases used to talk about the future:

without doubt I'm absolutely certain there's a good chance is quite likely there's no doubt that we are convinced it's highly probable is expected to

Now use these phrases to discuss these statements in small groups.

In the next five/ten/twenty years ...

cars will have an auto pilot.

sports cars will have a top speed of more than 300 km/h.

cars will use only one litre of petrol per 100 km.

environmentally-friendly cars will be more important.

cars will be like office with on-board computers and email facilities.

5. Work with a partner. Prepare a short presentation of these topics. Look at the useful phrases for help with presentation language.

1 am going to be speaking about ...

There'll be time for questions at the end.

Firstly/Secondly/Thirdly/Finally ...

Now we come to ...

In conclusion ...

Are there any questions?

- Fuels of the future
- The car of the future
- The future of my company

SUPPLEMENTARY READING

Read the following texts and make the summaries. Useful phrases are given below:

1. The object of this paper/ text is to present (to discuss, to describe, to show)…

2. The text discusses some problems relating to...

3. The paper begins with a short discussion on... At first, the author notes that (describes) ...

4. Next (Further, Then) the author explains that ... The next paragraph deals with (presents, discusses, describes) ...

5. The final paragraph states (describes, ends with) ... The conclusion is that the problem is ...

6. In my opinion (To my mind, I think) ... The text/ paper is interesting (not interesting), of importance (of little importance), valuable (invaluable), up-to-date (out-of-date), useful (useless) ...

TEXT 1
THE CHANGING EXPECTATIONS OF AUTOMOTIVE ENGINEERS

Vocabulary to use:

automotive engineer	инженер-механик, инженер-автомобилист
to be associated with	быть связанным с
suspension system	система подвески
door handle	дверная ручка
venture	решиться, рисковать
add-ons	дополнительные устройства
highlight	Придавать большое значение

competitive quality	конкурентоспособное качество
manufacturing capability	производственные (технологические) возможности
software development	Разработка программного обеспечения
vehicle performance evaluation	оценка работы машины
prior to	до
computer simulation	компьютерное моделирование
compliance	соответствие
regulations	технические нормы

In the past, automotive engineers were closely associated with the field of mechanical engineering. After all, most automotive engineers dealt with topics such as

gasoline and diesel engines, transmissions, suspension systems, chassis, door handles, seats, etc. A few ventured off into new developments such as turbine gas engines, continuously variable transmissions, or even Sterling engines. Some dealt with plastics and painting systems. The vast majority of knowledge needed by the automotive engineer of the past was mechanical in nature.

The reality of today is that the automotive engineer knows about far more than just mechanical engineering. To attract the best, the industry needs to project an image of the automotive engineer as someone with skills and knowledge beyond mechanical engineering.

The modern automobile has often been described as a computer on wheels. It is that and more — much more. Electronics control component systems such as the engine, transmission, and brakes. Those controls have become not just add-ons but integral parts of the operation of each system and the whole vehicle. A focus is on intelligent vehicle technology,

which highlighted the integration of more electronics into the vehicle.

No longer can design engineers "throw their designs over the wall" to the manufacturing engineer. The design engineer must know enough about the manufacturing capability of his/her organization or supplier, and the manufacturing engineer must be an early participant in the design team. Competitive quality and cost require that the design specifications match the manufacturing capability. Empty promises by manufacturing ("give us a design and w^{r}e will build it") are no longer accepted.

Software development is not only necessary to achieve optimum operation of each vehicle computer, but vehicle performance evaluation prior to design is becoming standard practice. Computer simulation for demonstrating compliance with regulations will probably be widely accepted in the not-too-distant future.

TEXT 2
METALS

Vocabulary to use:

lattice	решетка
metalloid	металлоид, полу-металл
nonmetal	неметалл
boron	бор
polonium	полоний
copper	медь
iron	железо
lead	свинец
conductance	проводимость

valence band	валентная область (зона)
ductile	эластичный
malleable	ковкий
alkali	щелочь
hydrochloric acid	хлористоводородная кислота

In chemistry, a metal (Greek: Metallon) is an element that readily forms ions and has metallic bonds, and metals are sometimes described as a lattice of positive ions in a cloud of electrons. The metals are one of the three groups of elements as distinguished by their ionization and bonding properties, along with the metalloids and nonmetals. On the periodic table, a diagonal line drawn from boron (B) to polonium (Po) separates the metals from the nonmetals. Elements on this line are metalloids, sometimes called semi- metals. Elements to the lower left are metals. Elements to the upper right are nonmetals.

Some well-known metals are aluminum, copper, gold, iron, lead, silver, titanium, uranium, and zinc.

A more modern definition of metals is that they have overlapping conductance and valence bands in their electronic structure. This definition opens up the category for metallic polymers and other organic metals, which have been made by researchers and employed in high-tech devices.

Aluminum is a metallic chemical element. It is ductile, malleable, and an excellent conductor of heat and electricity. The pure metal is soft. It becomes strong and hard when alloyed. Although it is chemically very reactive, aluminum resists corrosion. It is rapidly attacked by alkalies and by hydrochloric acid.

Important alloys of aluminum include duralumin, aluminum bronze, and aluminum-magnesium. They are used extensively in aircraft and other industries.

TEXT 3
ALLOYS

Vocabulary to use:

alloy property	Сплав Свойство
homogeneous	Однородный
heterogeneous	Неоднородный
tiny	Маленький
compound	Соединение
carbon	Углерод
hardening agent	Отверждагощий реагент
brittle	Хрупкий
advent of furnaces	появление печей
Damascus steel	булатная сталь
tensile	Растяжение
stainless steel	нержавеющая сталь

Alloy is a substance with metallic properties that consists of a metal fused with one or more metals or nonmetals. Alloys may be a homogeneous solid solution, a heterogeneous mixture of tiny crystals, a true chemical compound, or a mixture of these. Alloys are used more extensively than pure metals because they can be engineered to have specific properties.

New alloys are being engineered for use in new technology, including materials for the space program.

Steel is a metal alloy whose major component is iron and carbon. Carbon acts as a hardening agent. Steel with increased carbon content can be made harder and stronger than iron, but is also more brittle.

Currently there are several classes of steels in which

carbon is replaced with other alloying materials. A more recent definition is that steels are iron-based alloys that can be plastically formed.

There are different types of steels. Chromium steel finds wide use in automobile and airplane paits on account of its hardness, strength, and elasticity, as does the chromium-vanadium variety. In a modern sense, alloy steels have been made since the advent of furnaces capable of melting iron, into which other metals may be thrown and mixed. Also there exist Carbon steel and Damascus steel, which was famous in ancient times for its flexibility.

Nickel steel is the most widely used of the alloys. It is nonmagnetic and has the tensile properties of high-carbon steel without the brittleness.

Stainless steels and surgical stainless steels contain a minimum of 10.5% chromium, often combined with nickel, to resist corrosion. Some stainless steels are nonmagnetic. There are tool steels, HSLA Steel (High Strength, Low Alloy) and ferrous super alloys.

TEXT 4
DEFINITIONS

Vocabulary to use:

internal distribution of force	внутреннее распределение силы
tensor quantity	тензорная величина
compressive stress	сжимающее напряжение
uniaxial compression	одноосное, линейное сжатие
tensile stress	растягивающее напряжение
tensile loading	растягивающая нагрузка

shear stress	касательное напряжение
compressive strength	прочность при сжатии
compressive failure	разрушение при сжатии
ductile failure	Пластическое разрушение
brittle failure	хрупкое разрушение
tensile strength	прочность на растяжение
tensile failure	разрушение при растяжении
displacement field	поле перемещений
strain	напряжение, растяжение
quotient	Коэффициент, показатель
Hook's law	закон Гука
plasticity	Пластичность
irreversible transformation	необратимое преобразование
viscosity	Вязкость
creep	Ползучесть
Elastic deformation (Viscoelasticity)	упругая деформация
plastic deformation (Viscoplasticity)	пластичная деформация

Stress terms:

Stress is the internal distribution of forces within a body that balances and reacts to the loads applied to it. It is a complicated tensor quantity that can be broken down into simpler elements for engineering purposes:

• Compressive stress (or compression) is the stress state when the material tends to compact (volume decrease). A simple case of compression is the uniaxial compression induced by the action of opposite, pushing forces. Most materials can carry compressive stress.

• Tensile stress is a loading that tends to produce

stretching on a material by the application of axially directed pulling forces. Materials can withstand some tensile loading, but if enough force is applied, they will eventually break into two parts. Steel is an example of a material with high tensile strength.

• Shear stress is caused when a force is applied to produce a sliding failure of a material along a plane that is parallel to the direction of the applied force e.g. when cutting paper with scissors or a steel bolt with a bolt cutter.

Strength terms:

• Compressive strength is a limit state of compressive stress that leads to compressive failure in the manner of ductile failure or in the manner of brittle failure.

• Tensile strength is a limit state of tensile stress that leads to tensile failure in the manner of ductile failure or in the manner of brittle failure (sudden **breaking** in two or more pieces with a low stress state).

Strain - deformation terms:

• Deformation of the material is the change in geometry when stress is applied. Deformation is expressed by the displacement field of the material.

• Strain or reduced deformation is a mathematical term to express the trend of the deformation change among the material field. For uniaxial loadings - displacements of a specimen it is expressed as the quotient of the displacement and the length of the speciment.

Stress - strain relations:

• Elasticity is the linear response of materials in terms of stress and strain as described by Hook's law. Elasticity describes the state where the work offered by the application of external agents (forces), is stored in the material in form of elastic energy. It is recovered in form of displacement when external agents are removed.

• Plasticity is the non-linear response of materials in

terms of stress and strain. Plastic behaviour includes the irrevesible transformation of work offered by the application of external agents (forces) to forms of energy such as thermal energy or crack propagation-growth. When the agents are removed, the deformation remains.

• Viscosity is the non-linear time dependent response of materials in terms of stress and strain. The most known form of viscosity in solid mechanics is creep. Viscosity in solids may include elastic deformation (Viscoelasticity) or/and plastic deformation (Viscoplasticity).

TEXT 5
THE HISTORY OF THE AUTOMOBILE

Vocabulary to use:

steam	Пар
tricycle	трехколесный автомобиль
prevail	Преобладать
appear	Появляться
storage battery	аккумуляторная батарея
forerunner	Предшественник
gasoline-powered engine	бензиновый двигатель
horseless carriage	самодвижущийся экипаж
hand-crank	заводная рукоятка, ручка
mount	Устанавливать
steering	рулевое устройство
tiller	рулевой рычаг
gear	Передача
tire	Шина

rubber	Резина
smelly	Пахучий
shock absorber	Амортизатор
luxury	Роскошь
spark plug	свеча зажигания
reliable braking	надежное торможение
front suspension	передняя подвеска
large-scale production	крупномасштабное производство
seat adjuster	регулятор положения сиденья
ignition system	система зажигания
fuel efficiency	топливная экономичность
passenger safety	безопасность пассажиров
global positioning system (GPS)	глобальная навигационная спутниковая система
locator beacons	приводной маяк

About 8,000 cars were registered in America at the start of the 20th century. There are now some half billion in the world, one-third in the United States, where more than 1.5 trillion miles are traveled each year.

For hundreds of years, humans have attempted to develop means for faster, more economical travel. Vehicles have been powered by humans and animals. In 1769, Frenchman Nicolas-Joseph Cugnot built the first automobile. It was actually a steam-powered tricycle. During the 19lh century, steam power prevailed.

Electric cars appeared in the late 1800s. Cleaner than steam-powered cars, they had a large bank of storage batteries under the hood. They could travel at 10 to 20 miles per hour for a distance of 50 miles before the batteries needed recharging. In the second half of the 19th century, Siegfried Marcus of Austria

created the forerunner of the modern automobile. German engineer Gottlieb Daimler put a gasoline-powered engine on a bicycle. Karl Benz followed with the first gasoline car.

By 1900 a typical automobile in the United States looked something like this: It was shaped like a box, much like a horseless carriage. There was little protection from rain, dust, or other hazards. It was started by a hand-crank. Engines were mounted under the body, and steering was often by tiller. All of the parts including the gears and drive systems were exposed to the elements. Early tires were solid rubber. The arrival of pneumatic tires made the ride more comfortable. Kerosene side lamps and smelly acetylene headlamps lit the traveler's way. There were no shock absorbers or heating systems.

People wiio drove autos in the early days were seen as heroic adventurers.

By 1900 there were 50 automobile-manufacturing companies.

Engineers of that century began to enhance the popularity of the car and improve its safety. They included the electric starter in 1911. It was introduced by Charles Kettering.

By the middle of 1920s, other innovators were changing the industry. William Du- rant surpassed Ford in sales by offering variety. He began buying different car firms that built to different tastes - luxury, speed, comfort, and utility. The first were Olds, Oakland (later the Pontiac), and Cadillac. Then he bought out makers of motors, spark plugs, and other components and accessories. All this resulted in the General Motors Company, the forerunner of the modern automotive operation.

The 1930s saw more reliable braking, higher-compression engines, and the world's first diesel engine by Mercedes. Automobile engines were becoming larger, and many had 12 and 16 cylinders. Independent front suspension was added to make larger cars more comfortable.

Large-scale production began in the early 1950s. New automotive features included air conditioning, electrically operated car windows, seat adjusters, and a change from a 6-volt to a 12-volt ignition system which improved engine performance. Cars increased in size and weight, but power steering and brakes made them easier to handle.

In the early days of the car, the biggest worry was keeping it running. Today w[r]e are concerned with aerodynamic designs for speed and fuel efficiency, passenger safety issues, and pollution control systems. In 1900 a car might have a total of 100 parts, while today it has some 14,000, Accessories can include CD players, tape decks, television and phone installations, and separate sound and temperature controls in the front and back of a vehicle. Some cars are equipped with satellite-aided global positioning system (GPS) locator beacons.

In one form or another, the vehicle has become the major transporter of people and goods in the world. Its basic design and power systems have been widely adapted to vehicles such as the ambulance, jeep, police car, minivan, limousine, pickup truck, and tractor trailer.

TEXT 6
THE AUTOMOBILE LIFE CYCLE

Vocabulary to use:

conclude	Заканчиваться
scrapping	сдача в лом
approximately	Приблизительно
account for environmental impact	Составлять воздействие на окружающую среду

acquisition	Добывание
processing	Переработка
consumption	Потребление
copious amounts	огромное количество
involve	Включать
release	выделять, выпускать
assembly plant	сборочный завод
pollutant	загрязняющее вещество
coating	Покрытие
wastewater	сточные воды
trash	Мусор
scrap metal	Металлолом
emission	выброс, выделение

The life cycle of an automobile begins with concept and design and concludes with retirement (end-of-life scrapping). Today, a vehicle consists of approximately 15 000 parts. Steel, iron, glass, textiles, plastic, and non-ferrous metal dominate automobile construction. They account for more than 80% of the material used in today's vehicles. A common trend in the material composition of a car is toward increasing the use of lightweight materials, especially numerous types of plastics and light metal alloys (such as aluminum and magnesium). The environmental impacts and concerns that arise from the acquisition and processing of virgin resources that serve as input for automotive material include the substantial consumption of resources (material and energy). In addition, copious amounts of energy are consumed in heating, cooling, and producing millions of tons of steel, aluminum, plastic, and glass. Processing these materials involves a variety of heavy metals, toxic chemicals, chlorinated solvents, and ozone depleting chemicals. More than half of all releases and transfers

of pollutants originate from the painting and coating operations. The largest solid waste streams generated by an automobile assembly plant are wastewater treatment sludges, waste oil, plant trash, and scrap metal. The utilization of an automobile accounts for approximately 80% of the total primary energy consumption of the life cycle of an automobile. Most of the C02 and CO emissions are released during the utilization. Besides the resource consumption wlien running a vehicle and the necessary infrastructure (e.g. highways, service- and gas stations), the maintenance and service operations contribute significantly to the environmental effects of automobile use.

Opportunities for environmental improvement exist during each life-cycle stage of an automobile. Significant changes in the material and process selection and management are necessary to reduce the overall environmental impact throughout the entire life cycle of an automobile.

GRAMMAR EXERCISES

Comparatives, superlatives forms

1.1 Make up comparative and superlative forms of the adjectives and adverbs in the expressions listed below and translate them:

Important properties, a pure metal, much experience, new solutions, long service life, good protection, well-known metals, a solid solution, useful devices, high efficiency, bad results, a modern truck, a large team of designers.

1.2 Translate these sentences into Russian. Pay attention to the comparative and superlative forms of the adjectives and adverbs:

1. Metals are the most widely used materials in industry.

2. In general, a metal with small grains will be harder and stronger than one with coarse grains.

3. Small amounts of other metals, less than 1 per cent, are often added to a pure metal.

4. Toughness is different from strength: the toughest steels are different from the ones with highest tensile strength.

5. Plastics are lighter and more corrosion-resistant, but they are not usually as strong as metals.

6. Hot-worked products have better ductility and toughness than the unworked casting.

7. Rolling is the most common metalworking process.

8. Medium-carbon steels containing from 0.2 to 0.4 per cent carbon are tougher and are used as structural steels.

9. In operations that involve stretching, the best alloys are those which grow stronger with strain.

10. Metals such as copper and aluminium are more ductile in such operations than other metals.

11. The properties of a metal can be further improved by use of heat treatment.

12. The higher the pressure, the higher the temperature.

1.3 Translate the following word-combinations into English:

Самый доступный автомобиль, более прочный материал, наименьшая частица, самый обычный процесс, самое известное изобретение, гладкая поверхность, самый лучший проект, более низкая температура, наилучший сплав, более хрупкий металл, самые вредные вещества, новые методы.

There is/are

2.1 Translate the following sentences into Russian. Change the sentences into negative and questions:

1. There are many different electric cars around the world.
2. There were special driveways for trucks many years ago.
3. There is hardly a place in the world that is not covered by some line of communication.
4. Today there are several hundred million cars in the world not to mention millions of motorcycles.
5. There were few roads at the end of the 19 th century in Russia.
6. There are a lot of employment opportunities in mechanical engineering.
7. There is another version of the car where the rear seat can be completely folded away.
8. There will be eight remotely controlled TV cameras for complex crossing from Hyde Park Corner to the Hammersmith flyover.

Modal verbs

3.1. Read the following sentences, find modal verb or its equivalent and translate the sentences:

1. The atoms are arranged regularly and can slide over each over.
2. Lead is soft and can be bent by hand, while iron can only be worked by hammering at red heat.
3. Forging, bending, and shearing may be used alone, but often all three are used on one part.
4. Engineers must know how materials respond to external forces, such as tension, compression, torsion, bending and shear.

5. The materials may also have permanent deformation or they may fracture.

6. Stiffness is important when a rigid structure is to be made.

7. Ductile materials can absorb energy by deformation but brittle materials cannot.

8. Density is important in any application where the material must not be heavy.

9. All metals can be formed by drawing, rolling, hammering and extrusion, but some require hot-working.

10. These machines are not needed now, but they may be required in about ten years.

11. The ambulance car is to be specially equipped - the driver's compartment should be isolated from the patient room by a partition.

Список использованной литературы:

1. Голубев А.П. Английский язык для технических специальностей = English for Technical Colleges : учебник для студ. учреждений сред. проф. образования / А.П. Голубев., А.П. Коржавый., И.Б. Смирнова. - 4 -е изд., стер. -М. : Издательский центр «Академия», 2014. - 208 с.

2. Камянова Т. English Grammar rules & exercises. Сборник упражнений к основным правилам грамматики английского языка для школьников. М., ООО «Дом славянской книги», 2014 г. - 416 с.

3. Кривоногова О.В. Mechanical Engineering. Английский язык для инженеров-механиков: учебно-методическое пособие по английскому языку. Архангельск, 2011.

4. Попова А.С. English for power engineers: учебно-методическое пособие. / А.С. Попова. - Брянск: Издательство Брянский ГАУ, 2016. - 70с.

5. Шляхова В.А. Английский язык. Контрольные задания для студентов технических специальностей вузов: Учеб.-метод, пособие.-2-е изд., испр. и доп,- М.: Высшая школа, 2005.

6. Hornby A.S. Oxford Advanced Learner's Dictionary of Current English. - Oxford: Oxford University Press, 2007.

7. Галевский Г.В., Мауэр Л.В., Жуковский Н. С. Словарь по науке и технике (Англо - Русский) - М.: Флинта: Наука, 2003.

8. Рябцева Н.К. Научная речь на английском языке. Руководство по научному изложению. Словарь оборотов и сочетаемости общенаучной лексики: Новый словарь-справочник активного типа. - М.: Флинта: Наука, 2006.

9. Charlotte Williamson, Nigel Browing. Vehicle maintenance. - London: Cassel Illustrated, 2004.

The Fascination of Technology - Issue 02/2008.

Учебное издание

Попова Алла Сергеевна

ENGLISH FOR MECHANICAL ENGINEERS
учебно-методическое пособие

Редактор Лебедева Е.М.

Подписано к печати 05.10.2016 г. Формат 60x84 $^{1}/_{16}$.
Бумага офсетная. Усл. п. л. 3,31. Тираж 50 экз. Изд. № 5122.

Издательство Брянского государственного аграрного университета
243365 Брянская обл., Выгоничский район, с. Кокино, Брянский ГАУ