

**Saint Petersburg State University  
of Information Technologies,  
Mechanics and Optics**

# English for Part-Time Students



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Санкт-Петербургский государственный университет  
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Кафедра иностранных языков

Учебное пособие по английскому языку  
для студентов вечерней и заочной формы обучения  
(часть I)



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Данное учебное пособие предназначено для студентов ВИЗО и сможет быть использовано как на аудиторных занятиях, так и для самостоятельной работы студентов.

Пособие состоит из четырех глав, в трех из которых представлены тексты, знакомящие студентов с выдающимися учеными и их открытиями в различных областях наук, историей создания компьютера и системы Интернет. Грамматические задания, представленные в каждом уроке, включают в себя освоение наиболее частотных в технических текстах структур с неличными формами глаголов, условными предложениями, сослагательным наклонением. Четвертая глава содержит итоговые тесты, контролирующие усвоение студентами пройденного материала.

К учебному пособию прилагается алфавитный словарь с частотной социально-бытовой и терминологической лексикой.

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# Chapter I

## PHYSICS AND ENGINEERING

### Unit I

#### WORD-STUDY

##### *Words and word combinations to be remembered.*

to interact - взаимодействовать

force - сила

particles - частицы

at rest - в состоянии покоя

internal - внутренний

conservation - сохранение

to convert - переходить

fission - расщепление

fusion – слияние

##### **Exercise 1. Train the pronunciation and translate the international words.**

Physics, energy, magnetism, electricity, gravitation, orbits, planets, mechanics, electromagnetic, spectrum, radiation, nuclear, accelerate, acceleration.

##### **Exercise 2. Match the synonyms.**

1	2
1. behave	a) amount
2. form	b) act
3. quantity	c) shape
4. major	d) separate
5. century	e) main
	f) subject
	g) age

##### **Exercise 3. Match the antonyms.**

1	2
1. begin	a) internal
2. external	b) natural
3. free of	c) end
4. artificial	d) combine
5. divide	e) full of
6. completely	f) unnecessary
7. necessary	g) partially
8. straight	h) fusion
9. fission	i) curved
10. action	j) reaction
	k) motion
	l) basic

**Exercise 4. Remember explanations of the following terms.**

1. Mass is the internal quality of the object.
2. Energy is the kind and size of any change of the object.
3. Mechanics deals with the state of rest or motion of particles and rigid bodies and with forces acting on bodies.
4. Optics investigates and studies the process of light emission, its propagating in various medium and its interaction with the substance.
5. Electricity and magnetism are the basic subdivisions of physics dealing with existence, moving and interaction of charged particles.
6. Atomic physics deals with atoms, elements, their properties, the nature of atomic spectra.
7. Nuclear physics includes the discovery of the neutron and other fundamental particles.
8. Cryogenics – study of properties of matter at very low temperatures, including superconductivity.
9. Plasma physics studies controlled thermonuclear fusion and the exploration of space.
10. Accelerators – devices for bombarding nuclei with particles possessing billions of electron volts of energy.

**TEXT I**

**Comprehensive reading**

**SOME FACTS ABOUT PHYSICS**

Physics deals with matter and energy and how they interact. It begins by examining the information that people sense about the world around them.

Objects are seen to move\* from place to place, and when completely free of contact\*\* with other objects, they move in straight lines at a steady speed. Being at rest objects are said to move at a steady zero speed, whenever objects do not behave this way, they are said to be accelerated\*\*\*, and a “force” is said to act on them\*\*\*\*. The internal quality of the object is called “mass”. When forces act on objects the accelerations produce changes in such things as position, size, shape and chemical nature. The kind and size of any change is judged by\*\*\*\*\* use of a quantity called energy.

Therefore, energy forms include light, heat, sound, magnetism and electricity. Traditionally physics is divided into several major topics, namely, mechanics heat, optics, electricity and magnetism, atomic physics and nuclear physics. Because of the remarkable unity of Nature this separation into topics is, to some extent, artificial and exists for convenience.

Newton’s second law, relating force to acceleration and his third law relating action and reaction, form the basis of mechanics. Maxwell’s equations which

combine in mathematical form the laws discovered by Ampere, Faraday, form the basis of electricity, magnetism and optics.

An understanding of statics is necessary to describe the behavior of bulk matter and, with the laws of mechanics, electricity and magnetism, forms the basis of heat and thermodynamics. All these subdivisions constitute classical physics of the end of the 19<sup>th</sup> century. Modern physics began with the work of Plank and the theory of relativity.

Atomic physics made it possible for Mendeleev to construct his Periodic Table of Elements, to predict their properties and to understand the nature of atomic spectra. Nuclear physics has been rapidly developing since 1930 s. It includes the discovery of the neutron and other fundamental particles; the creation of artificial radioactivity, the discovery of nuclear fission and fusion; the development of particle accelerators for bombarding nuclei with particles possessing billions of electron volts of energy.

Active research flourishes in many other fields such as:

- solid state physics and cryogenics -study of properties of matter at very low temperatures, including superconductivity;
- microwave and radio frequency spectroscopy.

Plasma physics is growing rapidly because of the current search for controlled thermonuclear fusion and because of the exploration of space.

### **Notes:**

\*objects are seen to move – видно, как предметы движутся

\*\*free of contact – свободны от взаимодействия

\*\*\*they are said to be accelerated – говорят, что они ускоряются

\*\*\*\*a force is said to act on them – говорится, что на них действует сила

\*\*\*\*\*to be judged by – оцениваться

## **COMPREHENSION CHECK**

### **Exercise 1. Give answers to the following questions.**

1. What does physics deal with?
2. When do objects move (from place to place) in straight lines at a steady speed?
3. Is mass an external or internal quality of the object?
4. Do accelerations produce changes in position, size, shape and chemical nature?
5. How is physics traditionally divided into?

### **Exercise 2. Approve or disapprove the following statements. Begin your sentences with: “Yes, that’s right”, “No, I’m afraid that’s not so”.**

1. Physics begins by examining the information that people sense about the world around them.
2. When objects move in straight lines at a steady speed they are said to be accelerated.
3. The accelerations produce changes only in position of the object.
4. Separation of physics into several topics is to some extent artificial.

5. Nuclear physics began its rapid development in the XIX century.

**Exercise 3. Complete the sentences with the following words given below.**

1. Physics deals with...and... how they...
2. When objects move from place to place and when they are completely free of...with other objects, they move in ...lines at a ...speed.
3. When forces act on objects they produce...in such things as position, ...,..., and chemical nature.
4. Energy forms include ..., ..., ..., ..., and ... .
5. Newton's second law, relating force to acceleration, and his third law, relating action and reaction form the basis of...
6. Maxwell's equations form the basis of ..., ..., and ... .
7. All these ... constitute classical physics.
8. Quantum mechanics is the climax of Plank's quantum theory and the theory of ... of Einstein.
9. Atomic physics made Mendeleev's Periodic ... of ... possible.
10. ... physics includes the discovery of the neutron and other fundamental particles.

(matter, contract, energy, steady, straight, size, changes, mechanics, light, shape heat, subdivisions, optics, electricity, magnetism, Table of Elements, relativity, nuclear).

## LANGUAGE ACTIVITY

**Exercise 1. Insert articles where necessary.**

1. ... science of mechanics studies forces in bodies at rest and ... working forces in bodies in motion.
2. ... civil engineers use information from ... statics – how bodies behave at rest - to prevent disastrous movement in stable structures, such as ... bridges and ... buildings.
3. Aeronautical engineers use ... principle of ... dynamics - how ... bodies behave in motion - to design ... airplanes and ... rockets.
4. One of ... mechanical principles important to both those studies is ... center of gravity.
5. All the weight of ... solid body is centered at one point.

**Exercise 2. Insert prepositions where necessary: (of, in, by, with).**

1. The Royal Society was founded ... 1660. Its activities include scientific meetings, publications ... research work ... scientific journals, the delivery ... lectures, the presentation ... medals. Although an independent corporation, the Society has always had a special relationship ... the government.
2. The Royal Society of Arts was founded ... 1754. Its principal object has been to promote the progress ... departments ... science. It deals ... scientific, artistic, technical, industrial and commercial problems.



3. The British Association for the Advancement of Science was founded ... 1831 to promote general interest ... science and its application. One ... its chief activities was the annual meetings attended ... many young students as well as ... famous scientists.

**Exercise 3. Choose countable and uncountable nouns.**

Science, tooth, engineering, application, bridge, news, use, phenomenon, hydrogen, electronics, knowledge.

**Exercise 4. Make the following nouns plural.**

A mess, a day, a castle, an engineer, a shelf, a foot, a scientist, a woman, a photo, a glass, a ray, a cathode.

**Exercise 5. Give the singular form of the nouns.**

Devices, factories, phenomena, chiefs, children, data, nuclei, criteria.

**Exercise 6. Choose the correct form of the pronouns.**

1. She speaks so fast that I couldn't follow... (her, hers, herself).
2. For want of money (I, me, my) couldn't go abroad.
3. Newton published (his, him, himself) famous book "Principia" at the age of 42.
4. The Sun gives (we, us, ours) light during the day.
5. Halley, a famous astronomer, wrote Newton a lot of letters asking (him, his, he) to publish (him, his, he) scientific ideas.
6. Students write (their, they, them) term-papers twice a year.
7. She works at (her, hers, herself) graduation paper every day.
8. A friend of (my, mine, me) is reading for (him, his, himself) exam.
9. (We, ours, our) have passed (our, us, ours) exams. Let (we, ourselves, us) go to the cinema.
10. (Your, you, yours) faculty is more difficult than (our, we, ours).

**Exercise 7. Translate the sentences, paying attention to the function of the pronoun "it".**

1. It is autumn. It is cold.
2. It is necessary for all the students to know the fundamental laws of mechanics.
3. The term "engineering" is used in many specialties, it has many meanings.
4. We do not know much about it.
5. It was in the 19<sup>th</sup> century, that there appeared electrical engineering.

**Exercise 8. Translate sentences, paying attention to the functions of that and those.**

1. Energy that is produced by atomic station is used for various needs of national economy.
2. Do you know that man? He is a famous professor that delivers lectures on mechanics.
3. It is well known that personal experience depends on practical work.
4. The development of mechanical engineering began earlier than that of electrical one.

5. The materials that are used for refrigeration devices differ from those that are used for radio equipment.

**Exercise 9. Translate the sentences, paying attention to the functions of one and ones.**

1. I have only one English book.
2. He gave me a number of English books and some German ones.
3. One can see the Admiralty building on the left bank of the Neva.
4. The green car is mine and the black one is hers.
5. There was one more problem to solve - the problem of acceleration.

**Exercise 10. Pay attention to the translation of the words only, the only, very, the very, few, a few, little, a little.**

1. Very much attention was paid to the translation of some pronouns from the very beginning.
2. These are only a few facts about this science.
3. Civil engineering is not the only branch of engineering.
4. Few scientists supported the new theory because they had little information about it.
5. Röntgen was a little puzzled when he understood the rays were unknown to him.

**Exercise 11. Translate the sentences paying attention to the reflexive and the emphasizing pronouns.**

1. I am sure he will consider the problem himself.
2. You yourself insisted on my coming here.
3. We took part in this research ourselves.
4. The work itself was not so complicated as they had expected.
5. First-year students call themselves freshmen.

**Exercise 12. Insert the appropriate forms of the reflexive or emphasizing pronouns.**

1. Will you be able to carry out this experiment...?
2. We don't know it ... because the experiment ... will take a lot of time.
3. I was looking for the book ... but couldn't find it anywhere.
4. She couldn't rely on ... .
5. The results of the experiment seemed strange to the experimenter ....  
(ourselves, myself, herself, themselves, himself, itself, yourself)

**Exercise 13. Translate the following sentences paying attention to the words in bold type:**

- a) 1. She **waters** flowers every day. The **waters** of this river are clean. They will **water** these trees in summer. Give me some **water**, please. 2. The buildings and **houses** in this street are very high. This building **houses** a museum. The **house** is nice. This hall will **house** a picture exhibition.
- b) 1. England is one of the Great **Powers** of the world. 2. The Dean of our faculty does all in his **power** for the students. 3. Nuclear **power** stations will produce vast

amount of electricity. 4. The **power** of the King is limited. 5. Force, work, energy and **power** are studied in physics. 6. Our great **demands** for power in the next 30 years will be met by nuclear power. 7. The teacher **demands** that all the students should be present at the meeting. 8. The problems of **demand** and supply are studied in political economy.

**Exercise 14.** *Analyse the following sentences paying attention to the Active Tense forms of the verbs.*

1. My friend **studies** at a higher school. 2. He **entered** the Aviation Institute last year. 3. He **will graduate** from the Aviation Institute in five years. 4. Yesterday we **were** in the physics laboratory. 5. In summer the third-year students of our Institute **had** practical training at various plants.

**Exercise 15.** *Translate the following sentences paying attention to the Passive Tense forms of the verbs.*

1. Technical texts **are translated** by students. 2. A difficult problem **was solved** by him yesterday. 3. A composition **will be written** by us tomorrow. 4. A profound study of theory **is** generally **accompanied** by practical training. 5. Specialists for power industry **are trained** at some faculties of the University.

**Exercise 16.** *Translate the following sentences with Passive Constructions into Russian.*

1. In this lesson special attention is devoted to the proper translation of Passive Constructions.  
2. The Moscow University was founded by Lomonosov in 1755. 3. A course of lectures in instrument making will be delivered by our dean. 4. As a rule, practical training in well-equipped laboratories is included in the curriculum of technical universities. 5. In accordance with the program, research is carried out by first-year students. 6. The further development of science will be closely linked with the development of higher education.

**Exercise 17.** *Read and analyse the following sentences. Pay attention to the translation of Passive Constructions with Modal Verbs.*

1. Books on this subject can be found in every library.  
2. His good example must be followed.  
3. Lomonosov may be called the founder of higher education in Russia.  
4. Many complicated tasks can be solved by highly qualified specialists.

**Exercise 18.** *Change the following sentences:*

a) from Active into Passive.

1. Our scientists solve many important problems. 2. Yesterday we translated a difficult technical text. 3. The teacher will correct his translation next week. 4. We can translate this text without a dictionary.

b) from Passive into Active.

These sentences must be changed by us from Passive into Active. 2. Engineering drawing, physics, mechanics, mathematics are studied by the students of Technical Universities. 3. This problem was solved by Professor N. several years ago. 4. At the end of the course of studies a final project will be presented by the undergraduates.

## SUPPLEMENTARY TEXTS

### TEXT 1

*Read the text and say why the text is entitled so?*

### SOME MORE FACTS ABOUT PHYSICS

Energy forms, as we know, include light, heat, sound, magnetism and electricity. Gravitation, a pervasive\* force of the Universe, influences the orbits of planets around the Sun, as well as a gymnast's movements. One part of physics called *mechanics* is concerned with forces and motion. When force is applied to an object the object's motion is changed by use of energy. Energy is generally subdivided into types by the form of the change that is seen. Thus, the increase in speed is linked to an increase in *kinetic* (motion) energy.

Energy can change from one type to another. But any total branch of energy cannot be changed in amount – though it may be spread around, changed in form, or moved from one place to another. This “savings” plan is called the *law of conservation of mass-energy*, to allow for some of a system's energy being converted into matter and some of the matter being converted into energy.

#### **Notes:**

\*pervasive - проникающий

#### **Exercise 1. Speak on:**

- a) the new facts about physics given in this text.
- b) the law of energy mentioned in the text.

### TEXT 2

*Read the text. Compare it with the main text and say what other sciences physics comes close to.*

## WHAT IS PHYSICS

Physics is considered to be the most basic of the natural sciences. It deals with the fundamental constituents of matter and their interactions as well as the nature of atoms and the build-up\* of molecules and condensed matter. It tries to give unified description of the behavior of matter as well as of radiation, covering as many types

of phenomena as possible. In some of its applications it comes close to the classical areas of chemistry, and in others there are clear connections to the phenomena traditionally studied by astronomers. Present trends\*\* are even pointing toward a closer approach of some areas of physics and microbiology.

**Notes:**

\*build-up – строение

\*\*trend – направление

**Exercise 1. Answer the question. What is physics in your opinion? Look for extra information.**

**TEXT 3**

*Read and translate the text without a dictionary.*

**THE ELECTROMAGNETIC SPECTRUM**

Different forms of energy spread across a range called the *electromagnetic spectrum*. Energy forms in this spectrum have both electrical and magnetic characteristics. They travel as electromagnetic waves. All waves have *wavelength and frequency*. A wave has an uppermost crest\* and a bottommost trough\*\*. Wavelength is the distance between the crest of one wave and the next (or between the trough of one wave and the next). Wavelength may be expressed in millimicrons. Frequency is the number of waves that pass a given point in a given time. Frequency is expressed in *hertz*, or cycles per second. An inverse\*\*\* relationship exists in the electromagnetic spectrum. As the wavelengths of energy forms grow longer, their frequencies diminish\*\*\*\*. Gamma rays have the shortest wavelengths and the highest frequencies; long radio waves have the longest wavelengths and the lowest frequencies. We can directly sense only a small portion of the electromagnetic spectrum. We can see visible light and feel the heat of infrared rays. Other forms require instruments that convert the energy into perceptible\*\*\*\*\* forms, such as gamma ray counters\*\*\*\*\* or radio receivers.

**Notes:**

\*crest – максимум (зд. амплитуды)

\*\*trough – минимум (зд. амплитуды)

\*\*\*inverse – обратный

\*\*\*\*diminish - уменьшать

\*\*\*\*\*perceptible – воспринимаемый

\*\*\*\*\*counter - счетчик

## Unit II

### WORD STUDY

#### *Words and word combinations to be remembered.*

to branch off - ответвляться

chemical engineering - химическое машиностроение

civil engineering - гражданское строительство

civil engineer - инженер-строитель

communications engineering - техника средств связи

electrical engineering - электротехника

mechanical engineering - машиностроение

military engineering - военно-инженерное строительство

nuclear engineering - ядерная техника

power engineering - энергомашиностроение, энергетика

power engineer - инженер-энергетик

space engineering - космическая техника

#### **Exercise 1. State to what parts of speech the following words belong (pay attention to the suffixes).**

*Model:* equipment – существительное.

Possible, structure, impossible, construction, foundation, designer, engineering, profession, escalator, mechanical, economy, electrical.

#### **Exercise 2. Give verbs corresponding to the following nouns.**

*Model:* invention – invent.

Foundation, designer, production, elevator, equipment, formation.

#### **Exercise 3. Translate the following words (as verbs and as nouns).**

*Model:* design – проект; проектировать.

Place, use, result, change, construct, base.

#### **Exercise 4. Train the pronunciation and translate the international words.**

Aeronautics, construction, electric, electricity, equivalent, fortification, machine, modern, radio.

#### **Exercise 5. Match the synonyms.**

1	2
1.construction	a) building
2.house	b) project
3.design	c) cottage
4.branch	d) come into use
5.appear	e) field
6.profession	f) occupation
7.separate themselves from ...	g) basis
8.foundation	h) branch off
9.to apply	i) present-day
10.modern	j) to use
	k) palace
	l) structure

## TEXT I

### Comprehensive reading

#### ENGINEERING

A science dealing with design, construction and operation of structures, engines, machines, various devices is known in English as engineering for which it is sometimes difficult to find Russian equivalents.

The proper Russian equivalents are “техника, строительство, инженерное дело”.

Now the art of building houses, temples, pyramids and other structures is called “civil engineering”.

At the time of the Roman Empire there were already two branches of engineering: civil engineering and military engineering. Military engineering included the building of fortifications and military devices. One may find the remains of Roman structures in Italy, on the territory of modern England which was under Roman rule for about four centuries.

By time civil engineering grew into a profession requiring college training and has become an important branch of national economy.

With the invention of the steam engine and the growth of factories practical application of the science of mechanics and thermodynamics to the design of machines attracted the attention of civil engineers.

They called themselves “mechanical engineers”, separating themselves from civil engineering. It laid the foundation for a new branch of engineering – mechanical engineering.

Mechanical engineering deals with design, construction and operation of engines, turbines, air-conditioning, refrigeration devices, elevators, conveyors, escalators. The mechanical engineer designs machine-tools\* for various operations and their application in various production processes.

One of the many branches of mechanical engineering is aeronautics which deals with the mechanics of moving bodies in fluid or air.

In the 19<sup>th</sup> century with the development of the science of electricity a new branch of engineering – electrical engineering appeared.

Electrical engineering is divided into main branches: communications engineering and power engineering. Communications engineering deals with minute quantities of electricity, used for all kinds of communications; power engineering – with the means for producing power. Therefore, the electrical engineer designs radio, television and telephone equipment; the power engineer – generators, switches, transformers, etc.

In the middle of the 20<sup>th</sup> century there appeared new branches of engineering – nuclear engineering and space engineering.

Nuclear is based on atomic physics. Space engineering is impossible without all modern scientific achievements.

Present day engineering includes chemical engineering, dealing with processes and equipment possible to change the state, energy content, physical and chemical composition of various materials.

Nowadays there are hundreds of subdivisions of engineering but all of them branched off from civil, mechanical, electrical or chemical engineering.

**Notes:**

\*machine –tools – механизмы

## COMPREHENSION CHECK

**Exercise 1. Choose the sentences containing information from the text.**

1. The word “engineering” has many meanings.
2. There are some Russian equivalents of the term “engineering”.
3. The art of building was known hundreds years ago.
4. There wasn't any other branch of engineering besides civil engineering at the times of the Roman Empire.
5. The profession of civil engineer deals with many branches of national economy and science.
6. Electrical engineering is older than mechanical engineering.

**Exercise 2. Give the proper term to the following definitions: nuclear engineering, engineering, civil engineering, military engineering, mechanical engineering.**

1. ... is a science which deals with design, construction and operation of structures, machines, engines, devices used in industry and everyday life.
2. We call ... the art of building houses, palaces, temples and other structures.
3. ... includes the building of fortifications and military devices.
4. .... deals with the design and construction of steam engines, turbines, air-conditioning, and refrigeration devices.
5. ... is based on atomic physics.

## LANGUAGE ACTIVITY

**Exercise 1. Insert prepositions (in, into, at, of, by, from) where necessary.**

1. ... the 19<sup>th</sup> century civil engineering was enriched ... new achievements ... science.
2. The profession ... a civil engineer requires college training.
3. Dams, water systems, railways, etc. are built ... civil engineers.
4. Mechanical engineering achieved a prominent position ... the very beginning.
5. Electrical engineering is subdivided ... two branches.

**Exercise 2. Insert articles where necessary.**

- 1 ... term “engineering” is used in many specialties, it has many meanings.



2. This branch of industry appeared 30 years ago; very soon it achieved ... prominent position.
3. Mechanical engineering is one of ... most important branches of engineering.
4. ... physical changes are sometimes accompanied by ... chemical changes.
5. Among ... names of ... early inventors of steam engines we should mention ... name of Cherepanov.

**Exercise 3. Translate into English.**

1. Термин “engineering” имеет много значений. Одним из самых распространенных значений слова “engineering” является “техника”.
2. Самой старой отраслью техники считается гражданское строительство зданий, дорог, мостов.
3. Появление машиностроения было связано с изобретением паровой машины.
4. Инженер-механик имеет дело с проектированием и конструированием различных машин.
5. Появление электротехники связано с достижениями в области электричества.
6. В середине XX в. появились новые отрасли машиностроения: ядерная техника и космическая техника.
7. Ядерная техника основана на атомной физике.
8. Космическая техника базируется на достижениях всех отраслей науки и техники.

**Exercise 4. Translate the following sentences paying attention to different meanings of the words in bold type:**

1. An electric **current** can be alternative or direct.
2. The **current** in mountain rivers is very strong.
3. If you read newspapers regularly, you will know all **current** events.
4. We must **provide** all necessary conditions for the experiment.
5. Old people must be **provided** for by the state.
6. Students get grants **provided** they are full-time students.
7. The reaction **takes** place when the temperature rises.
8. He **takes** an active part in the life of our University.
9. The sick person was **taken** to hospital.
10. It usually **takes** me 40 minutes to get to the Institute.

**Exercise 5. Give the degrees of comparison of the following words.**

Difficult, high, large, long, useful, small, much, many, easy, little, far, fast, early, important, silent, slow, necessary, poor.

**Exercise 6. a) Insert “more” or “(the) most”:**

1. ... of all I liked this museum.
2. Mathematics is ... interesting for me than chemistry.
3. This subject is ... difficult than strength of materials.
4. She is ... beautiful girl here.

**b) add “-er” or “-est”:**

1. This student is the (clever) in our group.
2. The course in this Institute is (long) than in ours.
3. Your work is (short) than hers.
4. This hall is the (larg(e)) in our Institute.

**Exercise 7. Choose the correct degree of comparison.**

1. Pete is (better, the best) student in our group. His term-papers are always (better, the best) than yours. 2. This subject is (more interesting, the most interesting) of all subjects in this faculty. But it is (more difficult, the most difficult) than other subjects. 3. This student does not work at all. He is (worse, the worst) of all the students in our group. 4. The building of this university will be (better, the best) in the world. 5. Last year the enrolment to this institute was (larger, the largest) of all the institutes. 6. This term-paper is (worse, the worst) than yours.

**Exercise 8. Use the adjectives in the comparative or superlative degree.**

1. She didn't work (well) than you.  
2. Where is (near) bus stop?  
3. It will be (difficult) to translate the text without a dictionary.  
4. I think her illness was far (serious) than we thought at first.  
5. The flight was (dangerous) of all the flights made by the pilot.

**Exercise 9. Fill in the blanks with *as...as*, *not so...as*.**

1. His scientific career was not ... successful as his practice.  
2. These machines are ... reliable ... all lab equipment.  
3. Knowledge of theoretical material is ... important ... doing grammar exercises.  
4. The second-year students don't take ... many exams ... the third year students.  
5. You have made ... great progress in your studies ... your friends.

**Exercise 10. Use the construction *the ..., the ...*, combining the necessary parts of the two columns.**

1. The longer we waited	a) the more I like him.
2. The more I got to know him	b) the more impatient he became.
3. The earlier we leave	c) the more you want.
4. The more you practice your English	d) the faster you'll learn.
5. The longer the telephone call	e) the sooner we'll arrive.
	f) the more you have to pay.

**Exercise 11. Translate the following word combinations paying attention to Participle I and Participle II.**

1) The matter obtained, the substance applied, the solids determined, the particles included.  
2) The student determining, the girl describing, the scientist representing, the work implying.  
3) The workers doing, the work done; the property identified, the man identifying; the country represented, the delegation representing; the programme including, the sample included; the matter treated, the weight lifted; a body possessing, the means used.

**Exercise 12. Choose the correct form.**

1 At our University there are several subjects (studied, studying) optionally.

2. Students (taking, taken) exams next week should come to the dean's office. 3. The engineer (represented, representing) this factory is a good specialist. 4. The subject (discussed, discussing) at the conference is very important. 5. Scientists (applied, applying) such methods will obtain interesting results.

**Exercise 13. Translate the first -ed form as Participle II and the second -ed form as a predicate.**

*Model: the materials tested required – испытываемые материалы требовали*

The work performed showed, the results obtained demonstrated, the equipment tested required, the problem solved proved, the equation obtained resulted, the experiments discussed proved, the results obtained required.

**Exercise 14. Find the English equivalent to the following Russian sentence.**

1. Именно этот ученый играл основную роль в решении этой проблемы.
  - a) This scientist played an essential part in solving this problem.
  - b) It was this scientist who played an essential part in solving this problem.
  - c) It was at the time when that scientist was solving this problem.
2. Именно гражданское строительство связано со строительством домов, храмов, пирамид и т.д.
  - a) It is civil engineering that deals with construction of houses, temples and pyramids.
  - b) Civil engineering deals with construction of houses, temples and pyramids.
  - c) It is construction of houses that civil engineering deals with.

**Exercise 15. Fill in the blanks with the proper tenses of the verbs given in brackets.**

1. What you (to do) when I came in? I (to read) an article on internal combustion engines. 2. Where you (to go) when I met you? I (to go) to the library I (to intend) to read up for my exam. 3. We (to arrive) at the station when the train (to approach) the platform. 4. At the corner of the street we (to see) a car. The driver (to examine) its engine. 5. A man was stopped by a militiaman while he (to cross) the square. The militiaman said: "Why you (to cross) the square in the wrong place?"

**Exercise 16. Substitute the infinitive by the proper form of the verb (active or passive).**

1. At the end of the 19th century civil engineering (to enrich) with new achievements of science. 2. The profession of a civil engineer (to require) college training. 3. Now, civil engineering (to speak of) as an important branch of national economy. 4. It (to deal) with the building of industrial structures bridges, houses, tunnels, etc. 5. Dams, water systems, railways, etc. (to build) by civil engineers. 6. A very important branch of engineering (to call) mechanical engineering. 7. Mechanical engineering (to achieve) a prominent position from the very beginning. 8. Machine-tools (to use) in various production processes. 9. It (to know) that space engineering occupies a most prominent position. 10. It (to say) that electrical engineering (to subdivide) into two branches.

**Exercise 17. Translate the following dialogue into Russian and remember the meanings and use of either and neither.**

I.

A. Do you know what the words **either** and **neither** mean?

B. Yes, I do. **Either** means “каждый”, “любой”, “любой из двух”, while **neither** stands for “ни один (из)”.

A. That’s correct. Can you give examples?

B. Yes, I can. For example: There is a number of lecture rooms on **either** side of the corridor. Which of these two dictionaries may be used for translating a technical text? — You may use **either**.

A. And in what way is **either** translated when it is connected with or? For instance: bring some more dictionaries **either** from the library or from the reading room please.

B. **Either ... or ...** means “либо ... либо”, “или ... или”.

II.

A. Now, let us speak about **neither**; it is the negative form of the pronoun either, meaning “ни тот ни другой”. For instance: I was offered two books, but I took neither of them, as I did not like them.

B. And **neither** connected with **nor** means “ни ... ни”, for example: These problems seemed difficult **neither** to my friend, **nor** to me.

A. Are these words used in any other way?

B. Yes, they may be used in short negative sentences such as; “I don’t like this book”, said Peter. — “Neither do I”, said Ann, which means “мне тоже (не нравится)”. “I shall not go to the park tomorrow. He won't go **either**” “он тоже (не пойдет)”

## SUPPLEMENTARY TEXTS

### TEXT 1

*Read the text. What information would you add to the main text?*

### ENGINEERING EDUCATION

The education of an engineer extends over a wide range of knowledge: from pure science, or engineering science to technology. It is covered by various branches: civil, electrical, industrial, mechanical, metallurgical, geological, nuclear engineering etc.

An engineer’s education will be influenced by the choice he has made.

Modern engineering demands a sound training in general sciences particularly in physics, mathematics and chemistry. It may be added that the relative importance of the fundamental sciences depends on the corresponding branch of engineering.

For example, an electrical engineer needs extensive knowledge of physics, for an agricultural engineer a basic knowledge of biology is more important.

All specialities demand deep knowledge of computer, ability to deal skillfully with problems of human relations which is sometimes as important as technical knowledge.

## TEXT 2

*Read the text without a dictionary and supply it with a title.*

The science of *mechanics* studies the forces dormant\* in bodies at rest and the working forces in bodies in motion. Civil engineers use information from *statics* – how bodies behave at rest – to prevent disastrous\*\* movement in stable structures, such as bridges and buildings. Aeronautical engineers use the principles of *dynamics* – how bodies behave in motion – to design flyable airplanes and rockets.

One of the mechanical principles important to both those studies is *center of gravity*. Solid objects have one of many configurations, such as a hexagon, a cylinder, or pyramid. All of the weight of a solid body is considered to be centered at one point (represented by the dot in each solid). At this point, the downward pull of gravity is counteracted by equal forces pushing upward to keep the center at rest. However, if the upward or supporting forces are overcome by gravity at the object's center, the object becomes unstable and can topple\*\*\* in some cases. In other cases, the forces rotate the object when the force acts along a line that does not pass through the object's gravitational center.

### *Notes:*

\*dormant - бездействующий

\*\*disastrous - разрушительный

\*\*\*topple – упасть, потерять равновесие

## TEXT 3

*Read the text and name the basic robot's components.*

### THE ROBOT'S DESIGN

What are industrial robots and how do they work? Although they vary widely in shape, size and capability, industrial robots are made up of several basic components: the manipulator, the control and the power supply.

The manipulator is the mechanical device, which actually performs the useful functions of the robot. It is a hydraulically, pneumatically or electrically driven jointed mechanism capable of a number independent, coordinated motions. Feedback devices\* on the manipulator's joints or actuators provide information regarding its motions and positions to the robot control. A gripping\*\* device or tool, designed for the specific tasks to be done by the robot, is mounted\*\*\* on the outermost joint of the manipulator. Its function is directed by the robots control system.

The control stores\*\*\*\* the desired motions of the robot and their sequence\*\*\*\*\* in its memory; directs the manipulator through this sequence or “program” upon command; and interacts with the machines, conveyors and tools with which the robot works. Controls range in complexity from simple stepping switches to minicomputers.

***Notes:***

\*feedback devices

\*\*gripping – захватывающее

\*\*\*is mounted on – устанавливается

\*\*\*\*stores – хранит в памяти

\*\*\*\*\*sequence – последовательность

***Topic for discussion.***

***Your ideas of the future of robot’s design.***

## Chapter II

### GREAT SCIENTISTS – GREAT DISCOVERIES

#### Unit I

#### WORD-STUDY

##### *Words and word combinations to be remembered.*

oblate spheroidal shape – сжатый у полюсов сфероид

action and reaction – действие-противодействие

calculus – математический анализ

inquiry – зд. исследование

concise – точный

##### **Exercise 1. Read and translate the international words.**

Physicist, mathematician, farmer, result, to spiral, orbit, calculations, philosophy, inertia, acceleration, proportional, dynamics, approximation, universal, corpuscular.

##### **Exercise 2. Word-building.**

a) State to what part of speech the following words belong (mind the suffixes):

philosophy, significant, finally, motion, action, acceleration, proportional, hypothesis, appearance, deduce.

b) Analyze the form of the given nouns (a. singular; b. plural):

preachers, geometry, philosophy, discoveries, mathematics, tasks, time, shape, phenomena, law, analysis, synthesis, spectrum.

##### **Exercise 3. Give Russian equivalents to the following nouns with suffix –ance (-ence):**

Resistance, patience, significance, difference, independence, influence.

##### **Exercise 4. Make nouns with suffix –cy-. Give their Russian equivalents:**

Frequent, efficient, agent, constituent.

##### **Exercise 5. Match the antonyms.**

1	2
1. luckily	a) general
2. lunar	b) synthesis
3. to include	c) solar
4. natural	d) artificial
5. analysis	e) to exclude
6. particular	f) to follow
7. deduction	g) to combine
8. to precede	h) induction
9. to separate	i) to describe
10. experiment	j) observation
	k) unfortunately
	l) influence

## TEXT I

### *Reading for precise information.*

#### Part I

### ISAAC NEWTON (1642 – 1727)

Isaac Newton, an English physicist and mathematician was born in a poor farming family, and was sent to Cambridge to study to become a preacher. At Cambridge, Newton studied mathematics, being especially strongly influenced by Euclid's geometry and by Cartesian's philosophy. He was forced to leave Cambridge when it was closed because of\* the plague, and it was during this period that he made some of his most significant discoveries. He suggested that a particle, if released, would spiral in to the center of the Earth and proceeded to work out the mathematics of orbits, but did not publish his calculations. Halley, who had become interested in orbits, finally convinced Newton to expand and publish them. Newton devoted the period from August 1684 to spring 1686 to this task, and the result became one of the most important and influential works on physics of all times: *Philosophiæ Naturalis Principia Mathematica* (Mathematical Principles of Natural Philosophy) (1687), often shortened to *Principia Mathematica* or simply "the Principia". Newton opened his *Principia* with definitions and the three laws of motion now known as Newton's laws (laws of inertia, action and reaction, and acceleration proportional to force).

Book II presented Newton's new scientific philosophy. Finally, Book III consisted of applications of his dynamics, including an explanation for tides and a theory of lunar motion. To test his hypothesis of universal gravitation, Newton wrote Flamsteed to ask if Saturn had been observed to slow down upon passing Jupiter. The surprised Flamsteed replied that an effect had indeed been observed, and it was closely predicted by the calculations Newton had provided. Newton's equations were further confirmed by observing the shape of the Earth to be oblate spheroidal, as Newton claimed it should be.

Newton invented a scientific method which was truly universal in its scope\*\*. He presented his methodology as a set of four rules for scientific reasoning. These rules were stated in the *Principia* and proposed that (1) we are to admit no more causes of natural things such as are both true and sufficient to explain their appearances, (2) the same natural effects must be assigned to the same causes, (3) qualities of bodies are to be esteemed as universal, and (4) propositions deduced from observation of phenomena should be viewed as accurate until other phenomena contradict them. These four concise and universal rules for investigation were truly revolutionary. By their application, Newton formulated the universal laws of nature with which he was able to unravel virtually all the unsolved problems of his day.



## Part II

Newton created the compositional method of experimentation still practiced today. He wrote, "As in mathematics, so in natural philosophy (the physical science) the investigation of difficult things by the method of analysis ought ever to precede the method of composition. This analysis consists of making experiments and observations, and in drawing general conclusions\*\*\* from them, this way of analysis we may proceed from compounds to ingredients, and from motions to the forces producing them; and in general from effects to their causes, and from particular causes to more general ones. This is the method of analysis: and the synthesis consists in assuming the causes discovered and established as principles, and by them explaining the phenomena preceding from them, and proving the explanations.

Newton formulated the classical theories of mechanics, optics, the theory of sound and invented calculus though, he did not publish his work on calculus. In *Optics* (1704), Newton observed that white light could be separated by a prism into a spectrum of different colours, each characterized by a unique refractivity, and proposed the corpuscular theory of light. Newton also formulated a system of chemistry. In this corpuscular theory, "elements" consisted of different arrangements of atoms, and atoms consisted of small, hard, billiard ball-like particles.

Newton was the first to define and systematize experimental procedures. His methodology produced a neat balance between theoretical and experimental inquiry and between the mathematical and mechanical approaches. Newton mathematized all of the physical sciences, reducing their study to universal, and rational procedure which marked the ushering in of the age of Reason. The basic principles of investigation set down by Newton have persisted virtually without alteration until modern times. In the years since Newton's death, they have borne fruit\*\*\*\* far exceeding anything even Newton could have imagined. They form the foundation on which the technological civilization of today rests.

### *Notes:*

\*because of – из-за

\*\*in its scope – по своему масштабу

\*\*\*to draw conclusions – сделать выводы

\*\*\*\*have borne fruit – принесли плоды

## COMPREHENSION CHECK

**Exercise 1.** *The statements below are true according to the text except that:*

1. Isaac Newton is an English physicist and mathematician.
2. The result of Newton's scientific thinking was the most important work on physics of all times – "The Principia".
3. Newton discovered two laws of motion.
4. Newton invented a scientific method, which was truly universal in its scope.

5. Newton worked at the corpuscular theory of light.

**Exercise 2. Which of the following statements is true?**

1. Newton was born in a rich family.
2. He studied at Oxford.
3. The famous scientist worked and made his discoveries with his colleagues.
4. Isaac Newton predicted the return of Halley's Comet.
5. Newton didn't work at philosophical problems, he paid attention only to scientific experiments.

**Exercise 3. Which date refers to Newton's publication of his most important scientific work the "Principia"?**

- a) 1642
- b) 1687
- c) 1727

**Exercise 4. Make up a short summary of Part I and Part II in written form.**

## LANGUAGE ACTIVITY

**Exercise 1. Insert articles where necessary.**

1. ... second law gives a valuable means for ... measuring forces.
2. Any change in motion of ... body is in proportion to ... force pressing on it.
3. "Principia" was later on called ... greatest product of ... single human race.
4. At ... age of 12 Newton was sent to school, seven miles away from ... his home to continue his education.
5. On ... Earth's surface, however, it is difficult to demonstrate fully ... first law of motion.

**Exercise 2. Fill in the blanks with the prepositions (of, in, with, at, on, through, from).**

1. Newton's interests were centered ... mathematics and mechanics and ... studying different phenomena ... Nature.
2. The first proof of the first law is found ... the movement of the heavenly bodies, which meet practically no friction ... their traveling ... space.
3. The second law allows scientists to measure the force of gravitation ... any point ... the Earth's surface.
4. When you press a stone ... your finger, your finger press back ... the stone.
5. ... his three laws ... motion Newton established the framework for the general study of motion ... terms of mass and force.

**Exercise 3. Translate the following sentences paying attention to the words in bold type, that can be different parts of speech.**

1. They determined the **speed** of the body using a well-known formula. 2. The car **speeded** along the road. 3. The atoms **speeded** by a cyclotron impart their velocity to other atoms. 4. Under the **influence** of the force F the body will start into uniformly accelerated motion. 5. The force **influences** the body which starts moving. 6. No force of gravitation **influences** bodies in space.

**Exercise 4. Choose the word combinations which can be predicates.**

Is called, have been derived, derived substances, living matter, is living, will be associated, have been studied, has studied, were included, are being identified, identified substances, have been replaced, shall be devoted, the names given, is known, is represented, represented the Institute.

**Exercise 5. Translate the sentences paying attention to the use of the Present Perfect.**

1. I've read a very interesting book.
2. You say you haven't seen Bob for a long time. It's a pity.
3. The students have already done their laboratory work.
4. We've just discussed some important problems.
5. What are your plans for summer? – I haven't thought about them yet.

**Exercise 6. Translate the sentences paying attention to the use of the Past Perfect.**

1. We had finished Chapter I by the end of the 1<sup>st</sup> term.
2. The doctor had examined the patient before he was allowed to work.
3. The tourists had seen a lot of sights by their departure.
4. When he came downstairs he saw everybody had already left.
5. It was clear that the student had read a lot of scientific articles for his report.

**Exercise 7. Translate the sentences paying attention to the use of the Future Perfect.**

1. I'll have finished reading by the time you come.
2. You'll have studied the map of London by the end of the lesson.
3. By the end of our meeting we'll have settled all the questions.
4. When their mother arrives they will have moved to the new flat.
5. He will have published his new book by this time next year.

**Exercise 8. Choose the sentences with the Perfect Tenses in the Passive Voice.**

1. The paper has been published.
2. The paper was published yesterday.
3. The paper was being published yesterday.
4. The letter will be sent tomorrow.
5. The letter will have been sent tomorrow by 7 o'clock.
6. The paper had been published by 7 o'clock yesterday.

## SUPPLEMENTARY TEXTS

### TEXT 1

***Read the text and find the information about:***

1. Newton's explanation of the movement of planets and their satellites.
2. Newton's calculations, based on the laws of gravity.

At twenty two Isaac Newton began studying the theory of gravity. Many people already knew that the planets moved endlessly round the Sun but nobody could explain what kept them moving. Newton showed that the motions of the planets were the natural result of universal laws of nature. In his great work the "Principia" Newton clarified all that he had discovered about the movements of planets and their satellites. He said that a body in motion would continue to travel in a straight line forever unless some force was applied to stop it.

The laws of gravity enabled him to explain many mysteries of the structure of universe. Newton showed how the mass of the Sun could be calculated from the speed and distance of any planet. He calculated the force of gravity between the Sun and the planets and the quantity of matter in all these objects. He showed that the weight of the same body would be twenty-three times greater at the surface of the Sun than at the surface of the Earth. He found the true size and shape of the Earth.

### TEXT 2

***Reading for precise information.***

***Find the information in the text to answer the questions.***

1. What is the difference between magnetism and gravitation?
2. Who was the first scientist to study gravitation?
3. What law explains the structure of the universe?

## GRAVITATION

Gravitation is a very important force in the universe. Every object has a gravitational pull, which is like magnetism. But, unlike magnetism, gravitation is not only in iron and steel. It is in every object large or small; but large objects, such as earth, have a stronger pull than small ones.

Isaac Newton, the great scientist of the seventeenth century, first studied gravitation. When he was a boy, he often saw how apples fell to the ground. He wondered why they fell towards the Earth and why they did not fly up into the sky.

According to the law, which he later produced, everything in the universe attracts everything else towards itself. The Sun attracts the Earth and the Earth attracts the Sun. The earth attracts the moon and the moon attracts the Sun. Although the bigger object has the stronger attraction, all objects, in fact, have some attraction too but we do not notice the gravitational pull of a book because the pull of the Earth is very much greater.

Why does the Earth always move round the Sun, and not fly off into cold space? The Sun's gravitation gives the answer. The Earth always tries to move away in a straight line, but the Sun always pulls it back. So, it continues on its journey round and round the Sun.

### TEXT 3

*Read the text and approve or disapprove the statements using the information from the text.*

1. Halley was an outstanding astronomer.
2. It was Halley who insisted on Newton's publication the *Principia*.
3. Halley didn't play any role in Newton's life.

### WHAT MADE HALLEY KNOWN

Everyone knows of Halley having been an outstanding astronomer. It was he who had predicted the approach of a comet in 1705. The prediction being true, Halley's comet became one of the most popularly known of celestial bodies.

Yet, there is another no less important reason for remembering Halley: it was he who not only insisted that Newton should allow his *Principia* to be published, but also paid for the publication out of his own pocket.

It might be said that had Halley done no more than publishing Newton's immortal creation, he would have been remembered by many generations to come.

### TEXT 4

*Give the shortest definition of the three laws.*

### TREE LAWS OF MOTION

*First Law.* Every body continues in its state of rest or uniform motion in a straight line except in so far as it may be compelled by impressed force to change that state.

The first law introduces the idea of inertia and is often called the law of inertia. Inertia is defined as that property by virtue of which a body resists changes in motion.

Suppose that you are riding in a bus going 20 miles per hour. The bus stops suddenly. It is no longer doing 20 miles per hour. But you are. Unless you seize a handrail, you will keep moving due to your being a "body" in motion. Your having experienced a thrust is a demonstration of inertia.

On the Earth's surface, however, it is difficult to demonstrate fully the first law of motion because air-resistance and the tremendous forces of gravity prevent an object from traveling at constant speed in a straight line. But one of the first proofs of the first law is found in the movement of the heavenly bodies which meet practically no friction in their traveling through space.

Modern artificial satellites obey Newton's first law. Their being set on proper orbits, completely free from the Earth's atmosphere and air friction, is of great importance. It is known that some early satellites were burned up on account of their having been set on wrong orbits. Successful flights of modern spaceships have proved the validity of Newton's first law in actual practice.

*Second Law.* Any change in motion of a body is in proportion to the force pressing on it and takes place in the direction of the straight line in which the pressing force acts.

The second law gives a valuable means for measuring forces. The mathematical relationships provided by the second law allow scientists to measure the force of gravitation at any point of the Earth's surface. The ability of making such calculations is of great value in planning the orbit of an artificial satellite. The availability of electronic computers provides a reliable means for making the necessary calculations with great speed and accuracy.

*Third Law.* For every action exerted on a body, there is an equal and opposite reaction. Another way of stating the third law is this:

"Whenever one body exerts a force on another, the second body exerts an equal and opposite force on the first body."

For example, when you press a stone with your finger, your finger is also pressed back by the stone.

When you fire a rifle, the forward thrust of the bullet is matched by a backward thrust or "kick" against your shoulder.

Nowhere else today, perhaps, is Newton's third law of motion of such great importance as in the field of jet propulsion and rocket flights.

Rockets carry their fuel\* along with them and are able of traveling in outer space where there is no air and, hence, no air resistance\*\*. In the near-perfect vacuum of space Newton's third law operates ideally. The powerful thrust\*\*\* inside the rocket's engine results in an equal and opposite thrust forward of the rocket itself because there is no air-friction in outer space. Hence, the rockets' traveling with fantastic speeds of thousands of miles per hour is possible.

Both in the world of science and in our own daily lives Newton's three brief statements of motion are of great importance. In his three laws of motion Newton established the framework for the general study of motion in terms of mass and force.

The greatest achievements of science and engineering today are based on Newton's laws of motion, which are always and everywhere true.

**Notes:**

\*fuel – топливо

\*\*air resistance – сопротивление воздуха

\*\*\*thrust – толчок, удар

## DO YOU KNOW THAT:

1. Cambridge is one of the two oldest Universities which was founded in the 13<sup>th</sup> century.
2. Newton became a professor of Cambridge at the age of 26.
3. Halley was an outstanding astronomer who had predicted the approach of a comet in 1910, though he lived in Newton's times.
4. Newton didn't want to put down on paper the results of his twenty years' scientific thinking and he published his "Principia" when he was 42 years old.
5. The Latin inscription on Newton's tomb proclaims: "Mortals! Rejoice at so great an ornament to the human race!"

### **Words for understanding**

to predict-предсказывать  
approach-подход, приближение  
inscription-надпись  
tomb-надгробие, гробница  
to proclaim-провозглашать  
mortals-смертный  
to rejoice-возрадоваться  
ornament-украшение

### ***Topic for discussion.***

1. ***Speak on Newton's role in the development of science.***

## Unit II

### WORD-STUDY

*Words and word combinations to be remembered.*

current - ток

light-proof - светонепроницаемый

ray - луч

**Exercise 1.** *Give the Russian equivalents to the following international words and train their pronunciation.*

Cathode, cinema, effect, fact, fluorescent, medicine, monster, photographic, stop, tube.

**Exercise 2.** *Word-building.*

*a) Give Russian equivalents of the English words with the suffix –ist:*

physicist, scientist, theorist, idealist, artist, biologist.

*b) Give the definition to the following:*

1. What is a physicist?

2. What is a theorist?

3. What is a biologist?

### TEXT 1

*Reading for precise information.*

#### X-RAYS

In the closing month\* of 1895 the world was such as this: there was no radio, the cinema was only one year old, the first motor-cars had just appeared and the population thought they were horseless monsters.

At that very time there appeared an announcement that a German professor, Wilhelm Konrad Roentgen had discovered a new kind of rays. The rays were invisible, they could pass through skin and flesh, through clothes, but the cast shadows\*\* of the bones could be seen on a photographic plate.

Doctor Wilhelm Konrad Roentgen came to his discovery working with cathode-ray tubes of Joseph Thompson Crookes who was very much interested in the composition and possibilities of cathode rays, discovered by him.

Scientists thought these rays were valuable only for scientific research. But Crookes's cathode ray tubes played a very important role in Roentgen's discovery of his all-penetrating rays.

On this particular day Roengen was working in his darkened laboratory. Interested in the fact that Crookes's cathode rays caused certain chemicals to glow in the dark when they were brought close to the window through which the rays were emerging, Roentgen decided to find the reason for it.



Cathode rays could not penetrate the thin black cardboard in which Roentgen enclosed his Crookes tube. But when he switched on the current to his tube to make sure that his black box was light-proof, the scientist was puzzled again when he noticed a strange glow at the far corner of his laboratory bench. He switched on the current again and again and every time he saw a glow. At last he was sure that the glow had come from a small fluorescent screen which was lying there. What mysterious unknown rays caused this fluorescent effect?

Roentgen found that this effect was not due to the cathode rays; these unknown rays were able to penetrate the air much more strongly than the cathode rays came through his light-proof cardboard box, all sorts of opaque materials which he placed between the source of the new discovered rays and the fluorescent screen. These X-rays as he called them, passed through wood, thin sheets of aluminum, the flesh of his own hand and some other materials.

One more detail attracted the scientist's attention: X-rays were completely stopped by the bones of his hand. When he had tested their effect on photographic plates he saw that they were darkened on exposure to the X-rays.

Roentgen's discovery contributed much to the benefit of science. The first science to realize its importance was medicine. But medicine is only one field of their wide application.

X-ray examination has found application in various kinds of industrial processes.

### **Notes:**

\*closing month – последний месяц года

\*\*to cast shadows – отбрасывать тени

\*\*\*to be puzzled – быть озадаченным

\*\*\*\*due to – благодаря, из-за

\*\*\*\*\*to the benefit of – на пользу

## **COMPREHENSION CHECK**

### **Exercise 1. Answer the questions.**

1. When did Roentgen live?
2. Was he studying the properties of cathode rays when he came to his discovery of X-rays?
3. Did Crookes's invention follow Roentgen's discovery or did Roentgen's discovery follow Crookes's invention?
4. What could X-rays penetrate?
5. Is medicine the only field of X-rays application?

### **Exercise 2. Agree or disagree with the following statements. True-a; false-b.**

1. Roentgen was able to explain the nature of the new rays when he first noticed them.
2. All scientists had heard much about the all penetrating rays before Roentgen discovered them.

3. People realized the advantages of the newly discovered rays shortly after their discovery.
4. X-Rays examination finds application in various kinds of industrial process.
5. There were a lot of materials in Roentgen's lab, which could stop the unknown rays.

**Exercise 3. Make up a summary of the text.**

**Exercise 4. Complete the sentences with the words from the text (kind, photographic, cathode-ray, invisible, closing, to glow, computer, trigger, software).**

1. In the ...month of 1895 the world was such as this.
2. Wilhelm Konrad Roentgen discovered a new ...of rays which were ... .
3. These rays could pass through skin and...through clothes but the cast shadows of the bones could be seen on a ...plate.
4. Roentgen came to his discovery working with...tubes of Joseph Thompson Crookes.
5. Crookes's cathode rays caused certain chemicals to...in the dark.

## INCREASE YOUR VOCABULARY

**Exercise 1. Match the synonyms.**

1	2
1. population	a) wireless
2. radio	b) people
3. to discover	c) to emit
4. clothes	d) to invent
5. composition	e) material
6. possibilities	f) to make
7. to cause	g) structure
8. to emerge	h) opportunities
9. to penetrate	i) to see
10. to notice	j) to watch
	k) to pass through
	l) to explore

**Exercise 2. Choose the English explanation to the following words and word combinations from given below (couldn't be seen, was astonished, pass through, was certain, came from).**

*Model: closing month of 1895 - last month of 1895*

the rays were invisible –

Roentgen was sure -

the rays could penetrate -

he was puzzled -

the rays were emerging -

## LANGUAGE ACTIVITY

### Exercise 1. *Insert articles where necessary.*

1. Roentgen called ... rays which emerged from ... glass tube X-rays because at first he didn't understand what caused them.
2. ... fact that those rays were able to penetrate different objects stronger than ... cathode rays astonished Roentgen very much.
3. It was evident for Roentgen's contemporaries that ... discovery would have ... great future.
4. ... question was where these strange rays were emerging from.
5. ... object of his investigation was in what way it was possible to use ... new rays in ... medicine and ... industry.

### Exercise 2. *Insert the proper prepositions from given below (with, into, of, to, through, out, behind).*

1. Many people came ... Roentgen and asked him whether his rays could pass ... kinds ... objects.
2. They asked him what were the prospects ... their application and when he would be able to make a public demonstration ... his discovery.
3. The result ... his experimenting ... Crookes's tube surprised even himself.
4. Roentgen wanted to find ... why the fluorescent screen had been set a glow.
5. The fluorescent screen was lying some feet ... the masked tube.

### Exercise 3. *Translate the sentences paying attention to the meaning of the verbs "to cause", "to force", "to make".*

#### **Remember:**

the verbs "to force", "to cause", "to make" may have the meanings "заставлять", "вынуждать" and are used both in the Active and the Passive Voices. Don't forget the meaning of the verb "make" – "делать"

1. Roentgen was interested in the fact that the new rays caused certain chemical to glow.
2. Roentgen made his wife place her hand on a photographic plate.
3. The glow was caused by some unknown invisible rays.
4. The pressure of gases forces this device to move.
5. The parts of the measuring device are made of the new material.

### Exercise 4. *Translate the following sentences into Russian paying attention to the meanings of the words "the former ... the latter" – "первый ... последний".*

1. Fundamental and applied sciences are commonly distinguished, the former are interested in fundamental laws of nature, the latter in their practical application.
2. The subject of applied mechanics may be divided into statics and dynamics; the former deals with bodies in equilibrium, the latter with motion.
3. There are two kinds of motion: rectilinear and curvilinear, the former is motion of a particle along a straight line, the latter is the motion along a curved path.

**Exercise 5. Translate the sentences paying attention to the modal verbs: can, may, must, should.**

1. I can do this work myself without any help.
2. He couldn't say anything about new research in this field of physics.
3. You can find this dictionary everywhere.
4. This question is important for you, you must solve it yourself.
5. I could attend all these lectures although they were delivered at the St. Petersburg University.
6. My friend can write excellent compositions.
7. You may go to the south only after your final examination.
8. You should see the Dean as soon as possible.
9. The teacher said we might use a dictionary, if necessary.
10. At first Roentgen couldn't understand the nature of the new rays.

**Exercise 6. Translate the sentences paying attention to the equivalents of modal verbs.**

1. Will you be able to carry out this experiment yourself?
2. The students are allowed to take the next year's course only when they have passed the exams and tests required at the end of the academic year.
3. Sophia Kavalevskaya had to go abroad to get higher education.
4. Was she able to speak and write Spanish in her childhood?
5. I shall have to work hard to pass my exams successfully.
6. The examinations are to be held next month.
7. He had to take private lessons in physics as he had missed many lessons because of his illness.
8. According to the curriculum the first-year students are to do many laboratory works.
9. They had to consult a dictionary many times, the text was rather difficult.
10. It should be kept in mind that only hard labour makes a gifted person a great scientist.

**Exercise 7. Translate the following sentences with Participles (I, II) paying attention to the underlined adverbial modifiers.**

1. While being a student, Newton was greatly interested in the discoveries which had been made before.
2. Though conducted with great care, the test did not give the expected results.
3. Unless stopped by some external force, the body will keep moving due to inertia.
4. While making experiments, Newton discovered the law of inertia.
5. If emitted by a strong source of light, the rays would cast bright light on the distant objects.

**Exercise 8. Translate the following sentences paying attention to the Absolute Participle Construction.**

1. The plan having been discussed, the engineer's began a new experiment.
2. The problem having been solved, the meeting was over.

3. The temperature increasing, the speed of the reaction changes.
4. An external force acting, the body changes its state of rest to a state of motion.
5. The conditions being favorable, the experiments demonstrate certain properties of certain materials.
6. This law having been discovered, there are a lot of new possibilities.
7. The distorting force removed, elastic bodies exhibit the property of recovering to their original state.
8. A.N. Krylov occupied a prominent position among the scientists of the first half of the 20<sup>th</sup> century, his works being widely used in naval architecture, optics, physics, mathematics, mechanics and astronomy.
9. A.N. Krylov developed a course of lectures on the influence of water depth on the speed of ships, the subject being then quite novel.
10. The faculty created, he took an active part in its further development.

## **SUPPLEMENTARY TEXTS**

### **TEXT 1**

*Read the text and discuss the title.*

### **GENERATING X-RAYS**

X-rays are forms of radiation higher on the electro-magnetic spectrum than closely related ultraviolet waves\*. X-rays have great penetrating power because their short wavelength and high frequency let them travel easily between the atoms of a substance\*\*. X-rays are emitted from many sources in the universe. They can also be generated for medical and industrial uses. When photographic film is placed behind an object being X-rayed, the developed\*\*\* roentgenogram reveals\*\*\*\* a shadow picture of the object. For instance, when a hand is X-rayed, the roentgenogram shows the bones of the hand as white shapes against a black background. This is because X-rays do not penetrate the dense flesh and thus do not expose (darken) the areas of the film covered by the bones. X-rays can be produced by high-vacuum X-ray tubes. Such tubes consist of an airtight glass container with two electrodes – one positive and one negative – sealed inside. The cathode, or negative electrode, has a small coil of wire. The anode, or positive electrode, consists of a block of metal. An electric current flows through the cathode, causing it to become extremely hot. The heat releases electrons from the cathode. At the same time, a high voltage is applied across the cathode and the anode. This voltage forces the electrons to travel at high speeds towards the tungsten target\*\*\*\*\*. When the electrons strike the target, X-rays are produced.

#### **Notes:**

\*ultraviolet waves – ультрафиолетовые волны

\*\*substance – вещество

\*\*\*developed – проявленные  
\*\*\*\*to reveal – обнаруживать, выявлять  
\*\*\*\*\*to release – освобождать  
\*\*\*\*\*tungsten target – вольфрамовая мишень

**Exercise 1. Describe the process of generating X-rays, according to the plan.**

1. Forms of radiation of X-rays.
2. X-rays great penetration power.
3. The sources of their emission.
4. High vacuum X-rays tubes.

## **TEXT 2**

**Read the text and answer the questions.**

1. What is FESTA?
2. What does an X-ray generator developed by FESTA produce?
3. Where can such short pulses of bright X-rays be used?

### **X-RAY OPTICS**

FESTA is a research organization backed by 10 Japanese corporations. It works with the Electronical Laboratory (Tsukuba, Japan) on the Ministry of Economy, Trade and Industry's program, Research and Development of Metrological Technology Using Ultrashort Pulses.

A compact hard X-ray generator developed by FESTA delivers stable X-ray pulses. The new device generates X-ray bursts with 10000 photons per pulse which are a thousand times brighter than those obtainable from synchrotrons; also the pulse width is much shorter.

The device uses precisely controllable femtosecond high-brightness laser and ultra-short electron beams to produce X-rays.

The performance of the laser and the electron beam gun is developed to the point that their timing is precise enough to ensure practically 100% interaction between laser and electro beam.

Short pulses of bright X-rays such as these can be used for on-site diagnosis of turbines in power stations while they are in operation. The femtosecond pulses produced by the generator act like a super-high-speed camera in helping researchers to see the details of very fast moving objects such as turbine blades.

### TEXT 3

*Read the text without a dictionary and say if X-rays can be sent by post.*

#### X-RAYS BY POST

This happened when X-ray treatment\* was still a new invention W.K.Roentgen, the discoverer of X-rays, received a letter from a man. The man asked to send him “several X-rays with instructions how to use them”. He explained that he had been shot in the chest\*\* and the bullet\*\*\* still remained there. “I should like very much\*\*\*\* to go to you myself but unfortunately I have no time”.

The scientist replied: “I am very sorry but we have no X-rays now and besides, it is very difficult to send them by post. But there is a simpler thing you can do: send your chest by post to me”.

#### *Notes:*

\*X-ray treatment-лечение рентгеновскими лучами

\*\*chest – грудная клетка

\*\*\*bullet - пуля

\*\*\*\*I should like very much-Я бы очень хотел...

#### *Topic for discussion.*

**1. X-ray usage in different spheres of human’s life.**

### CONTROL TASKS

**Exercise 1. Read the following text without using a dictionary and give a summary of it.**

#### THE WORLD’S FIRST X-RAY PICTURE

Joseph Thomson Crookes was very much interested in the composition and possibilities of cathode rays which he had discovered.

But when cathode-ray tubes first appeared scientists thought that they were of no practical value, except for scientific research. Only in 1895 something changed that attitude. With the help of a cathode-ray tube, a German physicist, Doctor Wilhelm Konrad Roentgen, made his historical discovery of X-rays. One day, during the course of experimenting with the Crookes tube in his laboratory the scientist enclosed the tube in a lightproof box. Then he darkened his workshop to check whether any light was coming from the tube. To his surprise he noticed a glow coming from a nearby object, a metal screen coated with a fluorescent chemical. Roentgen thought that his cathode tube was giving off some kind of radiation rather than emitting light,

but what it was he could not say. Thus he gave the name X-ray to the unknown radiation.

Soon Roentgen found that those X-rays affected photographic plates. He made his wife place her hand on a photographic plate and aimed the mysterious rays upon it. The bone structure of the hand was closely outlined on the plate. Thus he had taken the world's first X-ray picture.

**Exercise 2. Give an English summary of the Russian text using the words given below.**

Рентген, немецкий физик, жил во второй половине XIX века. Он очень интересовался влиянием катодных лучей на некоторые химикалии. Для своих опытов он пользовался устройством, которое было изобретено английским физиком Круксом. Это устройство состояло из стеклянной трубки, из которой был выкачан воздух и в которой были запаяны два электрических провода. Когда концы этих проводов присоединялись к противоположным электрическим полюсам, то из отрицательного полюса, то есть, из катода вылетал поток электрических частиц. Это устройство называлось по имени его изобретателя трубкой Крукса.

Однажды в 1895 году, когда Рентген делал опыты в своей лаборатории, он заметил странное явление. Хотя трубка Крукса находилась в черной светонепроницаемой коробке, что-то светилось в дальнем углу лабораторного стола. Рентген обнаружил, что это была небольшая пластинка, которую он положил недалеко от черной коробки. Но что вызвало ее свечение? В лаборатории было совершенно темно, а катодные лучи не могли проникать сквозь светонепроницаемую коробку, которую он сделал из черного картона. Это означало, что на пластинку действовали какие-то другие лучи. Так как Рентген ничего не знал об этих лучах, он назвал их X-лучами.

Открытие Рентгена имело большое значение для развития многих отраслей науки и техники.

**Words for usage:**

влияние – influence

химикалии – chemicals

устройство – device

состоять из – consist of

быть выкачанным – to be pumped out

быть запаянным – to be sealed

провод – wire

присоединяться – to be connected

противоположный – opposite

полюс – pole

поток – flow

вылетать – to emerge

изобретатель – inventor



светонепроницаемый – light proof  
пластинка – plate  
вызывать – to cause

## Grammar Test

**Exercise 3. Use modal verbs (*can, may, must*) instead of their equivalents.**

a) may                      b) can                      c) must

1. The students will be allowed to conduct this experiment.
2. He was able to check the results of the experiments.
3. They are allowed to use dictionaries.
4. The students had to solve many problems.
5. I shall not be able to come to you.
6. The students have to conduct experiments.
7. The test is to start at 9 o'clock.
8. She was not allowed to take examinations in spring.
9. The designer was able to construct a new machine.
10. The students were allowed to use all the devices.
11. Electrons have to flow from the emitter to the collector.
12. She is able to help him.
13. The scientists will have to discuss the results.
14. Every worker is to know how to start an electric motor.
15. We were able to solve this equation.
16. They were not allowed to enter the laboratory.
17. I shall be allowed to take part in the conference.
18. This plant has to produce 4mln. TV sets.
19. We shall be able to translate this text without a dictionary.
20. We had to take part in this work.

## Unit III

### WORD-STUDY

*Words and word combinations to be remembered.*

extent-степень, предел

gap-пробел, пустое место

periodicity-периодичность

property-свойство

weight-вес

**Exercise 1.** *Give Russian equivalents to the following words without using a dictionary.*

atom, analysis, classification, concept, element, gallium, germanium, mendeleevium, metal, period, scandium, systematize, valence, zinc.

**Exercise 2.** *Match the synonyms.*

1	2
1. work	a) to wish
2. to investigate	b) at once
3. to want	c) job
4. immediately	d) to explore
5. to discover	e) to find out
6. to name	f) gap
7. to predict	g) to call
8. blank	h) to anticipate
	i) to correlate
	j) extent

## TEXT 1

### Comprehensive reading

#### Part I

#### DMITRY IVANOVICH MENDELEYEV (1834-1907)

Many scientists all over the world thought about the possibility of discovering some regularities in the properties of chemical elements.

The first scientist who started the quantitative analysis of chemical elements, known at that time, was the French chemist Lavoisier. In this way he set up the corner stone of the chemical science.

An English chemist, John Dalton followed his example turning his attention to the quantitative analysis. His greatest contribution to science was in assuming that different elements possess unlike atoms and in investigating the weights of the atoms.

By the middle of the XIX century chemical elements had been classified into two general groups: metals and non-metals. Studying their properties chemists noticed some “borderline” elements possessing the properties of both metals and non-metals and came to a new concept, called “valence” – the relative capacity of atoms to combine with one another. The new concept was universally adopted as a reliable means\*\* for classifying the properties of elements.

The result was building up a numerical scale of valences of the elements and revealing an important phenomenon: some elements displayed similarities so strong that they seemed to belong to the same\*\*\* “family”.

Using further the valence concept as a guide, scientists separated these groups exploring the extent of similarity.

An English experimentator, J. Newlands, proposed a law, according to which “properties are repeated at equal intervals when the elements are arranged\*\*\*\* in order of increasing atomic weight”.

However, Newlands succeeded in systematizing the properties of only a few elements.

## **Part II**

It was Dmitry Ivanovich Mendeleev, a Russian scientist, professor of St. Petersburg University, who built up a workable periodic classification of all then known\* elements, arranging them in a table. Mendeleev gave the best statement of the Periodic law: “The properties of the elements are in periodic dependence upon their the atomic weights”. The scientist correlated the whole chemistry of an element to weight of its atom.

Though there was no evidence that the atom was a composite body (it became known only thirty years later) the Table proved that the properties of the atoms were the source of all chemical properties of the ones.

Improving his Table D.I. Mendeleev predicted the properties of yet undiscovered elements, basing on the regularity of properties within the families of certain elements and on the dissimilarities between the neighboring elements.

Proving Mendeleev’s bold predictions, in 1875 the element gallium was discovered. It filled the gap immediately below zinc; in 1879 – scandium (below calcium); in 1886 it was germanium that filled the second gap below zinc. By 1900 the Table became a part of chemical science. At present all the gaps are filled. The 101<sup>st</sup> element discovered by American scientists in 1951 in honour of the Russian scientist was named mendeleevium.

D.I. Mendeleev’s Periodic Law is regarded as one of the most important achievements in the history of science, having won recognition all over the world. The Periodic Law has crossed national boundaries and has become the property of all nations, like the greatest discoveries of Newton, Copernicus, Lomonosov, Darwin, Einstein.

### **Notes:**

\*the then known-известных тогда

\*\*\*they seemed to belong-казалось, они принадлежат  
\*\*a reliable means-надежное средство  
\*\*\*to be arranged in – располагать, рассортировывать

## COMPREHENSION CHECK

### Exercise 1. *Find the right answer.*

1. Who was the originator of the quantitative analysis of chemical elements?
  - a) An unknown scientist.
  - b) A French chemist, Lavoisier.
  - c) Newton
2. Who took the first steps towards the atomic theory?
  - a) A French chemist, Lavoisier.
  - b) An English chemist, John Dalton.
  - c) An English experimentator, J. Newlands.
3. What groups were chemical elements classified into in the middle of the 19<sup>th</sup> century?
  - a) Metals and non-metals.
  - b) Radioactive and non-radioactive.
  - c) Heavy and light.
4. Who was the first to succeed in building up a workable periodic classification?
  - a) A Russian scientist, D.I. Mendeleev.
  - b) A group of scientists.
  - c) J.C. Röntgen.

### Exercise 2. *Choose the correct definition of the term.*

1. Chemistry is a science, studying ...
  - a) stars and planets
  - b) substances, chemical elements
  - c) laws of motion
2. Valence is ...
  - a) the smallest mass element
  - b) relative capacity of atoms to combine with another ones
  - c) the possibility of decomposing an element into others
3. A chemical element is ...
  - a) a definite number of atoms
  - b) a substance that cannot be divided into some different substances by ordinary means
  - c) a definite number of molecules

### Exercise 3. *What laws do the following statements define?*

1. Every body continues in its state of rest or uniform motion in a straight line except in so far as it may be compelled by impressed force to change that state.
  - a) Third Law of Motion
  - b) First Law of Motion

- c) The Periodic Law
2. The properties of the elements are in periodic dependence upon their atomic weights.
- a) First Law of Motion  
b) The Periodic Law  
c) Second Law of Motion
3. Any change in motion of a body is in proportion to the force pressing on it.
- a) The Periodic Law  
b) Third Law of Motion  
c) Second Law of Motion
4. For every action exerted on a body, there is an equal and opposite reaction.
- a) Second Law of Motion  
b) First Law of Motion  
c) The Periodic Law

## LANGUAGE ACTIVITY

### Exercise 1. *Insert articles where necessary.*

1. ... strong bonds are broken when ... water is formed from ... hydrogen and ... oxygen.
2. ... same kinds of ... chemical reactions that occur in ... inorganic chemistry also occur in ... organic chemistry.
3. ... valence concept is ... guide for scientists who tried to find some ... regularities in ... properties of elements.
4. It was D.I. Mendeleev, ... Russian scientist, who formulated ... Periodic Law—periodic dependence of ... properties of ... elements upon their atomic weights.

### Exercise 2. *Insert prepositions where necessary* (of, up, in, from, by).

Aluminum (Al) is the most abundant\* metal ... the world. About 8 per cent ... the earth's crust\*\* is made ... aluminum, but it never occurs\*\*\* naturally ... metallic state. It was first discovered as an element ... 1825.

Aluminum is very light ... weight, only one third as heavy as iron. It is bright and shiny\*\*\*\*, free ... rust and an excellent conductor ... heat and electricity. It's used ... building planes, bridges, automobiles.

Barium (Ba) was discovered ... 1808 ... the great English chemist H. Davy. Barium is a shiny, white heavy metal. It took its name ... the Greek word for "heavy". It has many industrial uses, in the refining\*\*\*\*\* ... sugar and ... the oil industry.

### Notes:

\*abundant – распространенный

\*\*crust – кора

\*\*\*to occur – встречаться

\*\*\*\*shiny – блестящий

\*\*\*\*\*refining – переработка

**Exercise 3. Choose the appropriate Present Tense (the right column) for each English verb (the left column).**

1. has read	a) Present Progressive
2. is reading	b) Present Perfect
3. have read	c) Present Simple
4. have been reading	e) Present Perfect Progressive
5. reads	

**Exercise 4. Translate the sentences paying attention to the Present Tenses.**

1. I'm sure you know something about this particular branch of physics.
2. Nobody has seen these results. He has been working so much at this experiment but doesn't want to show it to anybody until the work is completed.
3. Wherever they carry out their scientific work, they always inform us about the results obtained.
4. All kinds of work are going on in the laboratory except in nuclear physics.
5. If you take regular courses in classical physics first, then take quantum and static mechanics.

**Exercise 5. Choose the correct Present Tense form from given in brackets.**

1. I (have thought, think, are thinking) the discovery is of great importance.
2. Newton (is, are, am) a scientist of all times and of all nations.
3. The rate of chemical reactions (depend, depends, has depended) on temperature.
4. Where is Ann? She (experiments, is experimenting, has experimented) in the lab.
5. How long (is, has been, have been) she in the laboratory?

**Exercise 6. Choose the proper Present Tense form for the correct translation.**

1. Достижения медицины в последнее время дали возможность человеку вести активный образ жизни в преклонном возрасте.
  - a) make possible
  - b) makes possible
  - c) have made possible
2. Физик, который изучает<sup>1</sup> силы, удерживающие атомное ядро, несомненно, выполняет<sup>2</sup> очень важное исследование.
 

<sup>1</sup> a) study	<sup>2</sup> d) carry out
b) studies	e) has carried out
c) has studied	f) is carrying out
	g) has been carried out
3. Выводы теории относительности касаются скорости света.
  - a) concern
  - b) concerns
  - c) have concerned
4. Ученые верят, что природа ведет себя как единая система.
  - a) believes
  - b) believe
  - c) have believed

5. Наш университет работает над важнейшими проблемами в области исследования космоса и океана в течение ряда лет.

- a) have worked
- b) works
- c) has been working
- d) is working

**Exercise 7. Chose and insert the correct forms:**

*(a. are carried on; b. is being carried on; c. has been carried on; d. is carried on; e. have been carried on)*

1. Such experiments ... every day. 2. The experiment ... and the results are very good. 3. Don't enter the laboratory, a dangerous experiment ... . 4. A lot of experiments ... lately. 5. This very important experiment ... from time to time.

## SUPPLEMENTARY TEXTS

### TEXT 1

**Exercise 1. Read the text and be ready to enumerate the main dates of D.I. Mendeleev's life.**

#### DMITRY IVANOVICH MENDELEYEV

Dmitry Ivanovich Mendeleev, the great Russian scientist, the father of the Periodic Table of Elements, was born in Tobolsk in 1834 in the family of the director of the town gymnasium. He received a secondary education at the Tobolsk gymnasium. At the age of 16 he finished school and went to Petersburg where he entered the Pedagogical Institute and graduated from it with a gold medal in 1855. After graduation Mendeleev worked as a teacher for two years, first in the Simferopol and then Odessa gymnasiums. In 1859 Mendeleev received his first Degree and went abroad on a two-year scientific commission. In 1860 he took part in the World Chemical Congress in Karlsruhe, Germany.

When Mendeleev returned to Russia he was elected professor of the Petersburg Technological Institute and two years later professor of the Petersburg University, where he carried out scientific and pedagogical activities for twenty-three years. His lectures on chemistry were always interesting and the students of that time listened to them with great interest and attention. Besides lectures Mendeleev made a lot of experiments in his laboratory and at his classes. He recorded the results of his experiments and later analyzed them.

Mendeleev described more than 60 elements and found that all the elements could be divided into nine groups. Each of these groups may be divided into five rows. The elements of one group possess more or less similar properties. In 1869 Mendeleev published his Periodic Table of Elements which began a new era in chemical thought.

**Exercise 2. What do the following figures denote? (a) row of elements, b) groups of elements, c) elements, d) scientific works.**

1. 60
2. 9
3. 5

## **TEXT 2**

**Exercise 1. Read the text and explain why the text is entitled “From Mendeleev to Mendeleevum”.**

### **FROM MENDELEYEV TO MENDELEYEVUM**

When speaking about the Periodic Law, we cannot fail to stress its tremendous philosophical importance. It reflects the dialectical interdependence\* between the structure of atoms and the properties of elements, i.e., the transfer\*\* of quantity into a new quality. As the charges\*\*\* of the atomic nuclei grow and their electron shells alter\*\*\*\* we notice changes in the physical and chemical properties of the elements. Before Mendeleev, several chemists made attempts to find the law governing elements and systematize them. But they failed to build up a single comprehensive system.

It was only after gallium, scandium and germanium were discovered, and after the properties of a number of elements predicted by Mendeleev were confirmed, that Mendeleev was objectively recognized as the founder of the Periodic Law.

#### **Notes:**

\*interdependence – взаимозависимость

\*\*transfer – переход

\*\*\*charge – заряд

\*\*\*\*to alter – менять

**Exercise 2. Translate the passage concerning tremendous philosophical importance of the Periodic Law.**

**What Law of philosophy is mentioned in it?**

**Exercise 3. It is said in text 2 that several chemists made attempts to find the law governing elements.**

**Answer the question: Who were these “several chemists”? You may consult the main text.**



### TEXT 3

*Read the text in Russian and render it in English.*

*Words and word combinations to be used.*

To get a good education, leaving home, he would have to work much, to work hard, having graduated from, periodical changes, correlated, arranged, properties, atomic weight, made bold predictions, undiscovered elements, leaving gaps, for his numerous important discoveries, was elected.

Дмитрий Иванович Менделеев родился в семье школьного учителя в Сибири. Когда ему было четырнадцать лет, он решил поехать в Петербург, чтобы получить хорошее образование. Уезжая из дому, он понимал, что ему придется много работать, чтобы получить необходимые знания. Приехав в столицу, он сразу начал усиленно работать.

Успешно окончив педагогический институт, Менделеев начал экспериментировать с химическими элементами. Заинтересовавшись чередующимися свойствами различных химических элементов, Менделеев сопоставил свойства данного элемента с весом его атома. Он свел все тогда известные элементы в таблицу. Доказав соотношение свойств каждого элемента с весом его атома, Менделеев сделал смелые предположения о свойствах еще не открытых элементов, оставив для них свободные места в своей таблице.

За многочисленные важные открытия Дмитрий Иванович был избран профессором университета, где он проработал много лет.

Благодаря открытию периодического закона, имя Менделеева стало известным во всем мире. Умер Дмитрий Иванович Менделеев в 1907 году в возрасте 73 лет.

*Topic for discussion.*

*1. D.I. Mendeleev's scientific and pedagogical activities.*

## Unit IV

### WORD STUDY

#### *Words and word combinations to be remembered.*

relativity-относительность

extension-расширение

collision-столкновение

warping-скручивание, искривление

target-цель

homogeneity - однородность

#### **Exercise 1. Read and guess the meaning of the international words without using a dictionary.**

Effect, inertia, inertial, modification, equivalence, momentum, photoelectric, to postulate, to hypothesize, constant, suspension, homogeneity, isotropy.

#### **Exercise 2. Arrange the words according to their common roots. Translate them.**

To propose, relativity, description, to require, to satisfy, expressible, extension, collision, to arrange, warping, controversial, to require.

(requirement, proposal, satisfactory, to express, expression, to extend, to warp, relative, to describe, relation, to collide, arrangement, controversy, requirements)

#### **Exercise 3. Match the synonyms.**

1	2
1. scientific papers	a) profound
2. to propose	b) to demand
3. to provide	c) the same
4. speed	d) controversial
5. to require	e) peculiar
6. special	f) scientific works
7. remarkable	g) to spread
8. to decrease	h) to offer
9. to extend	i) velocity
	j) to reduce
	k) to interpret
	l) to supply

### TEXT

#### **Reading for precise information.**

**Read and translate the text, paying attention to the most important terms. What do they denote?**

## ALBERT EINSTEIN (1879-1955)

Einstein, Albert (1879-1955) is a German-American physicist who, in 1905, published three papers, each of which had a profound effect on the development of physics. In one paper, he proposed the theory of special relativity, which provides a correct description for particles traveling at high speeds. The two postulates of the special theory of relativity were that the speed of light in a vacuum is constant and that the laws of physics are the same for all inertial reference frames.

While special relativity required a modification of the laws of mechanics, the Maxwell equations were found to already satisfy the requirements\* of special relativity. Using special relativity, Einstein derived the equivalence of rest mass  $m_0$  and energy  $E$ . In another 1905 paper, Einstein also explained the photoelectric effect by hypothesizing that light consisted of particles (called photons), where  $h$  is a constant known as Planck's constant (named after the physicist Max Planck) and is the frequency of the photon. This represented an extension of Planck's quantization to light. Also in 1905, Einstein provided an explanation of Brownian motion using kinetic theory, stating that it was caused by random collisions of molecules. Einstein furthermore derived an equation stating that a suspension\*\* of small particles should arrange itself in an decreasing manner from bottom up. Using Einstein's equations for Brownian motion and the distribution of particles, it became possible experimentally to measure the value of Boltzmann's constant.

Einstein subsequently developed general relativity, which postulated that uniform acceleration and a gravitational field were equivalent, a statement known as the equivalence principle of gravitation. It interpreted gravity as a warping of space-time\*\*\*. Einstein investigated cosmological modeling, but found that the general theory of relativity would not satisfy the conditions of homogeneity, isotropy, and staticity unless an additional "cosmological constant" was added.

Einstein spent the latter portion of his life in an unsuccessful attempt to create a unified theory which would explain all known forces in nature as manifestations of a single fundamental force. Einstein's theories were highly controversial for years after he proposed them. In a recommendation for Einstein's membership in the Prussian Academy of Science, the sponsors wrote "In sum, one can say that there is hardly one among the great problems in which modern physics is so rich to which Einstein has not made a remarkable contribution. That he may sometimes have missed the targeting his speculations, as, for example, in his hypothesis of light-quanta, cannot really be held too much against him, for it is not possible to introduce really new ideas even in the most exact sciences without sometimes taking a risk".

### *Notes:*

\*to satisfy the requirements – удовлетворять требования

\*\*suspension – взвесь

\*\*\*a warping of space-time – искривление пространства-времени

## COMPREHENSION CHECK

**Exercise 1. Choose the only correct answer according to the text.**

1. Albert Einstein was an ... physicist.
  - a) English
  - b) Russian
  - c) German-American
2. It follows from the text that Einstein proposed ... theories of relativity.
  - a) two
  - b) three
  - c) five
3. The ... equations were found to satisfy the requirements of special relativity.
  - a) Faraday
  - b) Maxwell
  - c) Newton
4. Einstein provided an explanation of Browning motion using kinetic theory, stating that it was caused by ... .
  - a) random collisions of molecules
  - b) speed of light
  - c) gravitation
5. Einstein made a remarkable contribution in solving ... .
  - a) problems of biology
  - b) great problems of modern physics
  - c) problems of chemistry

## LANGUAGE ACTIVITY

**Exercise 1. Insert articles where necessary.**

1. ... Special relativity required ... modification of ... laws of ... mechanics.
2. Einstein derived ... equivalence of rest mass  $MO$  and ... energy  $F$ .
3. ... sponsors recommended for ... Einstein's membership in ... Prussian Academy of Science.
4. ... general relativity postulates that ... uniform acceleration and ... gravitational field are equivalent.
5. ... general theory of relativity made extensive use of Ricc-Curbastro's tensor calculus.
6. From 1911 Einstein realized ... importance of ... astronomical observations to ... his theories.

**Exercise 2. Choose the necessary prepositions from the given below:**

**(of, on, for, by, without, at, after, into, through)**

1. Einstein's scientific papers had a profound effect ... the development ... physics.
2. The two postulates ... his theory ... special relativity provide a correct description ... particles traveling... high speeds.

3. Einstein also explained the photoelectric effect ... hypothesizing that light consisted ... light particles (called photons).
4. Einstein's theories were highly controversial ... years ... he proposed them.
5. It is not possible to introduce reality new ideas even ... the most exact sciences ... taking a risk.

**Exercise 3. Choose the proper tense (the right column) for each English verb (the left column).**

1. instructed	a) Past Perfect
2. was instructing	b) Past Progressive
3. had instructed	c) Past Perfect Progressive
4. were instructing	d) Past Simple
5. had been instructing	

**Exercise 4. Arrange the predicates according to the Voice (a)-Active, b)-Passive).**

Had been achieved, defined, had been finished, had discussed, were making, was expressed, got, were being published, had been emitting, was writing.

**Exercise 5. Translate the sentences paying attention to the Past Tenses.**

1. Nuclear energy was discovered in the process of creating the atomic bomb.
2. The great Russian inventor of the past I.P. Kulibin made a lantern which could cast a powerful beam of light a long distance ahead.
3. Kulibin's art had attracted attention in the capital.
4. The lantern was made of a great number of small mirrors which had been arranged so that they intensified the light of a single candle placed in the center 500 times.
5. When Halley came to Newton he was surprised to learn that Newton had solved the problem of elliptical orbits two years before.

**Exercise 6. Choose the proper Past Tense form from given in brackets.**

1. Being a student Newton (had been, was, were) greatly interested in the discoveries which (were made, made, had been made, were making) before.
2. The Company's lawyer informed that Jackson (was working, worked, had been working) in the mills for 17 years.
3. While the champion (crossed, was crossing, had crossed, was crossed) the channel, a special boat (accompanied, had accompanied, was accompanied) him.
4. A.N. Krylov, an outstanding scientist, (had known, knew, was known) Latin and (translated, had translated, was translating, was translated) Newton's Optics.
5. The approach of Halley's comet (expected, had been expected, was expected) in 1910.

## SUPPLEMENTARY TEXTS

### TEXT 1

*Read, translate the text and say how theories of gravitation developed.*

#### General Relativity: The Background\* to the Theory

General relativity is a theory of gravitation and to understand the background to the theory we have to look at how theories of gravitation developed. Aristotle's notion of the motion of bodies impeded\*\* understanding of gravitation for a long time. He believed that force could only be applied by contact, force at a distance being impossible, and a constant force was required to maintain\*\*\* a body in uniform motion.

Copernicus's view of the solar system was important as it allowed sensible consideration\*\*\*\* of gravitation. Kepler's laws of planetary motion and Galileo's understanding of the motion and falling bodies set the scene for Newton's theory of gravity which was presented in the *Principia* in 1687.

Newton's axioms of motion were reworked by Lagrange, Hamilton, and Jacobi into very powerful and general methods, which employed\*\*\*\*\* new analytic quantities. Newton's universal gravitation was considered proved correct, thanks to the work of Clairaut and Laplace. In fact the so-called three-body problem was extensively studied in the 19<sup>th</sup> century and was not properly understood until much later. The study of the gravitational potential allowed variations in gravitation caused by irregularities in the shape of the earth to be studied both practically and theoretically.

#### *Notes:*

\*background – фон

\*\*to impede – препятствовать

\*\*\*to maintain – поддерживать

\*\*\*\*consideration – рассмотрение

\*\*\*\*\*to employ – применять

#### **Exercise 1. Agree or disagree with the following statements. (T-true, F-false)**

3. Aristotle impeded understanding of gravitation for a long time.
2. Copernicus's view of the solar system was important, so were Kepler's laws of planetary motion and falling bodies.
3. Newton's theory of gravity didn't play any role in the development of Einstein's theory of general relativity.

### TEXT 2

*Read the text and say who worked at the explanation of cause of gravitation. (Name the scientists). Find the sentence proving the title.*

## The Only Weakness of Newton's Theory of Gravitation

Newton's theory of gravitation was highly successful. There was little reason to question it except for one weakness which was to explain how each of the two bodies knew the other was there. Some profound remarks about gravitation were made by Maxwell in 1864. In his major work *A dynamical theory of the electromagnetic field* (1864) it was written: ... *to explain the electromagnetic action between distant bodies without assuming the existence of forces capable of acting directly at sensible\* distances.*

Maxwell notes that there is a paradox caused by the attraction of like bodies. The energy of the medium must be decreased by the presence of the bodies. In 1900 Lorentz conjectured\*\* that gravitation could be attributed\*\*\* to actions which propagate with the velocity of light. Poincare, in a paper in July 1905 suggested that all forces should transform according to the Lorentz transformations. In this case he notes that Newton's law of gravitation is not valid and proposed gravitational waves which propagated\*\*\*\* with the velocity of light.

### Notes:

\*sensible – ошутимый

\*\*to conjecture – предполагать

\*\*\*to be attributed – приписывать к...

\*\*\*\*to propagate – распространять(ся)

## TEXT 3

*Scan the text and name the scientists, mentioned in the text.*

### **Astronomical Observation – the final confirmation to the theory of general relativity**

On the 18<sup>th</sup> November Einstein made a discovery about which he wrote *For a few days I was beside myself\* with joyous excitement.* The problem involved the advance of the perihelion of the planet Mercury. Le Verrier, in 1859, had noted that the perihelion (the point where the planet is closest to the Sun) advanced by 38'' per century more than could be accounted for\*\* from other causes. Many possible solutions\*\*\* were proposed, Venus was 10% heavier than was thought, there was another planet inside Mercury's orbit, the Sun was more oblate than observed, Mercury had a moon. From 1911 Einstein had realized the importance of astronomical observations to his theories and he had worked with Freundlich to make measurements of Mercury's orbit required to confirm the general theory of relativity. Freundlich confirmed 43'' per century in a paper of 1913 instead of 38'' per century as the scientist had thought. Einstein applied his theory of gravitation and discovered that the advance of 43'' per century was exactly accounted for without any need to postulate invisible moons or any other special hypothesis.

On 25 November Einstein submitted his paper which gave the correct field equations for general relativity. The calculation of bending of light and the advance of Mercury's perihelion remained as he had calculated it one week earlier.

Emmy Noether's theorem was published with a proof in 1918. This theorem has become a vital tool in theoretical physics.

Immediately after Einstein's 1915 paper giving the correct field equations, Karl Schwarzschild found in 1916 a mathematical solution to the equations which corresponds to the gravitational field of a massive compact object. At the time this was purely theoretical work but, of course, work on neutron stars, pulsars and black holes relied entirely on Schwarzschild's solutions and has made this part of the most important work going on in astronomy today.

**Notes:**

\*to be beside oneself – БЫТЬ ВНЕ СЕБЯ

\*\*to account for – ОБЪЯСНЯТЬ ЧТО-ЛИБО

\*\*\*solution – решение

**Exercise 1. Find the definition of the term “perihelion” in the text.**

**Exercise 2. Give definitions to the following terms according to the text.**

Special relativity –

General relativity –

**DO YOU KNOW THAT:**

1. When a pamphlet was published entitled “100 Authors Against Einstein”, Einstein retorted “If I were wrong, one would be enough”.

2. Some famous Einstein quotes include:

“I do not believe in immortality of the individual, and I consider ethics to be an exclusively human concern with no superhuman authority behind it.”

“I want to know how God created this world. I am not interested in this or that phenomena in the spectrum of this or that element”.

“Science without religion is lame, religion without science is blind”.

“It's a mistake often made in this country to measure things by the amount of money they cost”.

**Words for references:**

to retort-парировать

quotes-высказывания, цитаты

immortality-бессмертие

ethics-этика

exclusively-исключительно

concern-забота, интерес

lame-хромой

blind-слепой

**Topic for discussion.**

**1. Einstein's contribution to the development of physics.**



## Unit V

### WORD-STUDY

#### *Words and word combinations to be remembered.*

jet propulsion-реактивное движение

luminary-светило

combustion-сгорание

chamber-камера

exhaust velocity-скорость истечения (струй ракетного двигателя)

propellant-ракетное топливо

#### **Exercise 1. a) State to what part of speech the following words belong according to their suffixes: noun, verb, adjective, adverb.**

Pioneer, astronautics, theorize, propulsion, important, forester, emigrate, formal, theoretically.

#### **b) Give verbs corresponding to the following nouns.**

Creator, promotion, elimination, emigration, analysis.

#### **Exercise 2. Pronounce the international words.**

Reactive, cosmonaut, impulse, orbital, photograph, pilot, reactive, philosopher, individual.

#### **Exercise 3. Match the synonyms.**

1	2
1. space	a) compartment
2. exploration	b) spaceship
3. combustible	c) astronaut
agent	d) travel
4. spacecraft	e) cosmos
5. chamber	f) research
6. cosmonaut	g) fuel
7. journey	h) missile
8. to utilize	i) to use
9. rocket	j) to discharge
	k) jet propulsion

#### **Exercise 4. Match the antonyms.**

1	2
1. terrestrial	a) weightlessness
2. to launch	b) rear end
3. automatic	c) celestial
4. individual	d) manned
5. dream	e) to land
6. soft landing	f) reality
7. gravity	g) common
8. visible	h) hard landing
9. front end	i) to receive
10. to transmit	j) invisible
	k) to explore

## TEXT 1

### Comprehensive reading

#### KONSTANTIN EDUARDOVITCH TSIOLKOVSKY (1857-1935)

"The Earth is the cradle of the mankind,  
but we cannot live forever in a cradle".

Konstantin Eduardovitch Tsiolkovsky was a true visionary and pioneer of astronautics. He theorized many aspects of human space travel and rocket propulsion decades before others, and played an important role in the development of the Soviet and Russian space programs. He was born on September 17, 1857, in the village of Ijevskoe, Ryasan Province, Russia, in the family of a Polish forester who had emigrated to Russia. At the age of 10 he lost his hearing as the result of scarlet fever. After that he couldn't attend school, and he never received any formal education. His books were his teachers, and he read every book in his father's library. Later Tsiolkovsky remembered that during all his life he tried to prove to himself and to others that he could improve his knowledge, even with his disability.

In 1873-1876 Konstantin Tsiolkovsky lived in Moscow. He went to the main Moscow libraries and in this way received his self-education. While in Moscow, Tsiolkovsky was tutored by the eccentric and brilliant Russian philosopher Nikolai Fedorovitch Fedorov, who was working in a Moscow library at the time, and gave Tsiolkovsky a place to work in the library. At the age of 17, while living in Moscow, Tsiolkovsky dreamed about the possibility of space flight, in part, inspired by\* the novels of Jules Verne. Since that time he started to think about the problems of space vehicle\*\* design. His great purpose was not simply to go into outer space, but to live in space, to become a space civilization.

In 1876-1879 he lived in Vyatka and Ryasan. After passing his exams, he received his Teacher's Certificate, and went to work as a math teacher in Borovsk, Kaluga Province.

In 1880-1892 Tsiolkovsky lived in Borovsk and worked as a teacher. At that time he began his scientific research in air balloon building, life in free space, aerodynamics and philosophy.

In 1892-1935 he lived and worked in Kaluga. His moving to Kaluga was the result of his teaching promotion. It was here in Kaluga that he became a well-known scientist, wrote and published his theories of space flight and inter-planetary travels. In Kaluga he wrote his Cosmic Philosophy, and dreamed about the far distant future of humanity, including the eventual conquest of space and our leaving the cradle of the planet Earth for the stars. He was made a member of the Soviet Academy of Science in 1919 and earned international recognition\*\*\* for his ideas. He wrote over 500 scientific papers, and, even though he never created any rockets himself, he influenced many young Russian engineers and designers. Tsiolkovsky lived to see a younger generation of Russian engineers and scientists who began to make his

visionary concepts reality. Among these was Sergey Korolev, who later became the "Chief Designer" of the Soviet space program. Korolev was one of his most outstanding followers.

Konstantin Tsiolkovsky, the father of cosmonautics, died in Kaluga at the age of 78 on September 19, 1935.

### **Notes:**

\*to be inspired by-под влиянием

\*\*space vehicle-космический транспорт

\*\*\*to earn recognition- завоевать призвание

## **COMPREHENSION CHECK**

**Exercise 1. Choose the right completion word according to the text (visionary, emigrated, hearing, flight, pioneer, forever, pilot).**

1. The Earth is the cradle of the mankind, but we can't live ... in a cradle.
2. Tsiolkovsky was a true ... and ... of astronautics.
3. His father, a Polish forester, ... to Russia from Poland.
4. At the age of 10 Tsiolkovsky lost his ... as the result of scarlet fever.
5. While living in Moscow he started to think about the possibility of space ... .

**Exercise 2. Choose the sentences, which contain the information from the text and correct the wrong ones.**

1. All his life Tsiolkovsky tried to prove to himself and to others that he could improve his knowledge even with his disability.
2. Since that time he started to think about the problems of space vehicle design.
3. His great purpose was not simply to go into outer space, but to live in space, to become a space civilization.
4. Tsiolkovsky wrote over 50 scientific papers.
5. Tsiolkovsky didn't see a younger generation of Russian engineers and designers, who began to make his visionary concepts reality.

## **LANGUAGE ACTIVITY**

**Exercise 1. Insert prepositions where necessary: (of, after, to, by, at, for, in).**

1. ... that time Tsiolkovsky believed that trips ... Mars would start only ... many hundreds ...years.
2. The first copy ... Tsiolkovsky paper was: "Exploration ... Space ... Reaction Apparatus".
3. ... many centuries the scientists were wondering what the other side of the Moon looked like.
4. Some years later he went ... Moscow to continue his studies.
5. Reliability is particularly important ... manned spaceships.

**Exercise 2. Insert articles where necessary.**

1. We should mention ... few words about ... importance of reliability for space rocket engineering.
2. ... designer was sure that ... new spaceship would meet all ... demands.
3. Many people are eager to become ... cosmonauts.
4. This question occupied ... minds of ... space explorers.
5. Y.A.Gagarin was ... first cosmonaut who made ... orbital flight around ... Earth.

**Exercise 3. Choose the appropriate Future Tense (the right column) for each English verb (the left column).**

1. will read	a) Future Perfect Active Voice
2. shall have read	b) Future Simple Active
3. will be reading	c) Future Progressive Active
4. will be read	d) Future Perfect Progressive
5. shall have been reading	e) Future Perfect Passive
6. will have been read	f) Future Simple Passive

**Exercise 4. Arrange the predicates according to the Voice (Active, Passive).**

Will form, will be established, will associate, will have been carried off, will be vanishing, will have been running, shall divide.

**Exercise 5. Choose the proper Future Tense form from given in brackets.**

1. This phenomenon (will have been studied, will study, will be studied) by scientists in future.
2. They (will be applied, will apply, will have been applied) the device in their experiments.
3. Free-electron lasers (will be becoming, will have become, will become) capable of generating very high-power radiation.
4. The fiber is totally immune to all kinds of interferences it (will not have created, will not create, will create) ground loops of any kind.
5. We (shall have, shall have had, shall be having) the necessary results by the end of our work.

**Exercise 6. Translate the sentences paying attention to the meaning of the verbs: "shall", "should", "will", "would".**

- 1) shall – 1. Future (буду, будем) – 1 л. ед. мн. ч.  
2. Modal verb (нужно)
- 2) should – 1. Future – in the Past  
2. Modal verb (следует)
- 3) will – 1. Future (будет, будут) – 2,3 л. ед. мн. ч.  
2. polite form (вежливая форма)
- 4) would – 1. Future – in the Past  
2. polite form (вежливая форма)

1. We shall take part in the scientific conference.

2. Lasers should be used only by trained personnel wearing protective glasses.
3. K.E. Tsiolkovsky was sure that the mankind would leave its cradle-the Earth.
4. Will these beams be reflected if we change the temperature?
5. This procedure will give us the possibility of determining both the state estimation and the time delay.
6. Experts predicated that optical computing would become very effective.
7. Will you please repeat the data obtained?
8. - What did you say?  
- I said I should compare some scientific articles on this subject and choose the most important one.
9. Would you inform them of the new schedule?
10. We will describe the brief theory of our concept (and the method of making a hologram).

## SUPPLEMENTARY TEXTS

### TEXT 1

***Read the text, translate it, and be ready to speak on Tsiolkovsky's theories, which laid the foundation of the new science – the theory of rocket flying. Use the words given below.***

### TSIOLKOVSKY'S THEORY

#### 1. Tsiolkovsky's Theory of Rocket Propulsion.

Tsiolkovsky laid the foundation of a new science – the theory of rocket flying. In his paper (1903) "Exploration of Space by Reaction Apparatus" Tsiolkovsky offered to use the principle of reactive motion for interplanetary vehicles. The scientist developed the law of the rocket motion as a motion of a body with variable mass in space, both without gravity field and in gravity field. He determined the rocket's efficiency, the effect of air drag\* on the rocket's motion, etc.

Tsiolkovsky calculated the basic formula which describes the motion of a rocket and determines its velocity. The formula is also true when designing multi-stage rockets (the velocities of individual stages are summed up). It also shows that the velocity acquired by the rocket is directly proportional to the exhaust velocity. It means that the capacity of the rockets depends mainly on the specific impulse\*\* of its engine.

This formula is now universally known as Tsiolkovsky's formula.

2. It was Tsiolkovsky who suggested a number of fundamental engineering solutions for rocket design and developed principles of *the theory of liquid propellant engines*.

3. Tsiolkovsky designed a rocket for long-range flight. It was an oblong chamber, or shell of the kind used for airships, with passenger compartment and controls located in its front end and the combustible agent, liquid oxygen and hydrogen filling

the greater part of the rockets body. The exhaust gases were to be discharged\*\*\* at a great speed through a pipe and a nozzle\*\*\*\* extending from the rear end of the rocket.

Thus, Tsiolkovsky was the first to approach the problem of jet propulsion scientifically and to prove the possibility of utilizing a jet-propelled vehicle for interplanetary communication.

**Notes:**

\*air drag-аэродинамическое сопротивление

\*\*specific impulse-удельная тяга, удельный импульс

\*\*\*to discharge-выбрасывать, выпускать

\*\*\*\*nozzle-сопло, форсунка

**TEXT 2**

***Read the text and entitle it.***

***What dates are mentioned in the text, what do they denote?***

Tsiolkovsky's principles were taken as a foundation for development of space engineering which provided the possibility for the launch of the first sputnik, manned orbital flights and flights to other planets. The historical event which practically proved the possibility of manned orbital flights took place on April 12, 1961 when the Soviet spaceship Vostok I carried the first in the world cosmonaut, Yuri Gagarin, around the Earth.

Successful orbital flights were soon followed by space flights.

In the autumn of 1959 Man finally got his first glimpses of the other side of the Moon. Luna 3 was the first space probe to photograph another planetary body and transmit pictures back to the Earth.

In 1966 Luna 9 made the initial soft landing on the Moon and transmitted its first Luna panorama. The analysis of the pictures showed that there was no danger for a spacecraft landing to sink into its surface, which was strong enough to support astronauts.

A series of American "Surveyor" and "Orbiter" missions provided some more information about the Moon's surface and helped to find a place for the landing of three American cosmonauts in 1969.

In the closing month of 1970 another automatic station made its first in the world landing on the Venus. In 2004 an American automatic station continued exploring another planet of the Solar System – the Mars and found ice there which shows the possibility of existence of living matter on our mysterious neighbor.

On May 1, 1933 Tsiolkovsky said:

"I have been working on jet engines for forty years and I thought that trips to Mars would start only after many hundreds of years. But times are changing. I believe that many of you will witness the first journey beyond the Earth's atmosphere".

And, indeed, the dream he was speaking about on that day has come true.

## TEXT 3

*Make up a short summary of the text.*

### TSIOLKOVSKY'S PHILOSOPHY

Tsiolkovsky was as much interested in the philosophy of space as he was in the engineering to make space flight possible. His main work on this subject was "Ethics or the Natural Foundations of Morality" (1902-1918). In 1932 Tsiolkovsky wrote "The Cosmic Philosophy" – the summary of his philosophical ideas. His main idea was to achieve happiness not only for the humanity, but also for all living beings in the Universe. He believed that human occupation of space was inevitable and would influence the evolution. According to Tsiolkovsky's Cosmic Philosophy, "happiness" is the absence of all kinds of suffering in the Universe as well as the absence of all the processes of destroying goodness. How shall we start this evolution to the "Universal Happiness"? The main task is to study the laws which rule the Universe, and therefore we must learn how to live in outer space. To begin that long period of our evolution we'll have to design large manned space rockets. So the first space flight will be the beginning of the new era of space exploration, the beginning of Space Culture in human history. It will be the beginning of our history itself. He truly believed that it was the role of the mankind to occupy the solar system and than to expand into the depth of the Cosmos, using the energy of the stars to create a cosmic civilization that would master nature, abolish natural catastrophes and achieve happiness for all. The great thinker wrote,

"Men are weak now and yet they transform the Earth's surface. In millions of years their might will increase to the extent, that they will change the surface of the Earth, its oceans, the atmosphere, and themselves. They will control the climate and the solar system just as they control the Earth. They will travel beyond the limits of our planetary system, they will reach other suns and use their fresh energy instead of the energy of their dying luminary".

### DO YOU KNOW THAT:

#### I

1. The earliest manuscript of Tsiolkovsky was "Astronomical Drawings" (1873). He drew the Solar System, the distances between the planets, their satellites.
2. "Exploration of Space by Reaction Apparatus" (In the monthly magazine "The Science Review" № 5 ST. Petersburg, 1903) – is the first publication in the world on this subject.
3. Tsiolkovsky also wrote science fiction books including "On the Moon" (1895), "Dream of the Earth and Sky" (1895) and "Beyond the Earth" (1920).

#### II

In 1926 Tsiolkovsky published his “Plan of Space Exploration”, consisting of sixteen steps for human expansion into space:

1. Creation of rocket airplanes with wings.
2. Progressive increasing the speed and altitude of these airplanes.
3. Production of real rockets-without wings.
4. Ability to land on the surface of the sea.
5. Reaching escape velocity (about 8 Km/second), and the first flight into the Earth orbit.
6. Lengthening rocket flight time in space.
7. Experimental use of plants to make an artificial atmosphere in spaceships.
8. Using pressurized space suits for activity outs of spaceships.
9. Making orbiting greenhouses for plants.
10. Constructing large orbital habitats around the Earth.
11. Using solar radiation to grow food, to heat space quarters, and for transport throughout the Solar System.
12. Colonization of the asteroid belt.
13. Colonization of the entire Solar System and beyond it.
14. Achievement of individual and social perfection.
15. Overcrowding of the Solar System and the colonization of the Milky Way (the Galaxy).
16. The Sun begins to die and the people remaining in the Solar System’s population go to other suns.

***Topic for discussion.***

1. ***K.E. Tsiolkovsky’s role in paving the way to cosmic flights.***



## Grammar Test in Tenses.

### Task 1. Define the tense in the following sentences.

I.

1. What are you doing here? I'm looking for my pen.
2. He goes to the theatre every Sunday.
3. The students are writing a test now.
4. They have been writing it for an hour already.
5. I have just received a letter from him.
6. We haven't met since we left school.
7. The woman who is speaking to Paul is our teacher.
8. I will speak to him before you return.
9. Every thing will become clear as soon as he receives your letter.
10. When I came into the room they were discussing something.
11. They had been discussing the article for a long time when I came.
12. It was raining hard when I left the house.
13. Tomorrow at 10 o'clock we'll be writing composition.
14. When we came home she was still making a dinner.
15. I have been trying to explain it to you for an hour but you aren't listening to me.
16. When did he come? – He came 10 minutes ago.
17. Have they got a car? – Yes, they have had a car for 2 years already.
18. My brother has been teaching at school since 1995.
19. When will you be there tomorrow? – I will be there at 10 o'clock.
20. We will be waiting for you at 10 o'clock.

II.

1. How long have you been reading this book?
2. When she was in the train, she remembered that she had left the book at home.
3. They have been living in this house for 5 years.
4. My sister had been ill for many days when I learnt about it.
5. Did you know that he hadn't written a composition?
6. We haven't received letters from her for many months already.
7. How long have you been working at this factory?
8. He had already gone, when Helen switched on the radio.
9. I have been working at this problem for 3 months.
10. Fortunately the rain had already stopped when we went out.
11. How long have you been working at this school?

### Task 2. Translate and add the words to characterize the action (in Russian) Add the words to show the time of the action.

Model: produces – производит (вообще, постоянно)

<u>Tense</u>	<u>Translation</u>	<u>Time Definition</u>
is producing	_____	_____
has produced	_____	_____
had produced	_____	_____

was producing  
will be producing  
will have produced

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## Chapter III COMPUTERS

### Unit I

#### WORD-STUDY

##### *Words and word combinations to be remembered.*

Abacus – счеты

notation – нотация, система отчисления

gear-driven – работающие на зубчатой передаче

dial – диск

punched card – перфокарта

storage – хранение

digital – цифровой

switch – переключатель

access – доступ

maintenance – обслуживание

compiler – компилятор, составитель

terminal (n) – терминал

reentry – ввод заново

##### **Exercise 1. Form nouns with the following suffixes.**

*Noun + ist*

art, journal, physics, piano, violin, economics

*Verb + er*

employ, shop, teach, work, write, cook.

*Verb + or*

operate, sail, supervise, invest, navigate.

##### **Exercise 2. Train the pronunciation and translate the international words.**

Logarithm, calculator, calculation, machine, textile, to construct, construction, manufacture, statistics, automatic, transistor, to code, innovation, intensive, population, positional, navigation, accumulation, prototype, to modify, scanner, transmission.

##### **Exercise 3. Pay attention to the translation of nouns as attributes.**

“Unit record” principle, punched card principle, input and output equipment, high speed card readers and printers, machine language programming, random access devices, repair and maintenance time, magnetic ink character readers, computer equipment, air conditioning.

**Exercise 4. Match the synonyms.**

1	2
1. machine	a) to manufacture
2. in existence	b) to eliminate
3. to make	c) distant
4. valuable	d) in use
5. punched cards	e) device
6. to produce	f) to do
7. to reduce	g) important
8. remote	h) cards with holes
9. components	i) to substitute
10. to replace	j) to put into
11. to introduce	operation
12. ability	k) parts
13. feature	l) tool
	m) capability
	n) characteristic

**TEXT I**

**Comprehensive reading**

**Part I**

*Read the text paying attention to the role of different scientists in the development of computers.*

**HISTORY OF THE COMPUTER**

For a long time a man has been looking for ways of increasing the speed of computations.

The history of computers starts out about 3000 B.C. at the birth of the abacus, a wooden rack holding two horizontal wires with beads which are moved around according to programming rules memorized by the user, so all regular arithmetic problems can be done. It is still in existence\* and used by some part of the world's population. It made valuable contributions, including positional notation. Another important invention around the same time was the Astrolabe, used for navigation.

The achievements in this field which step by step led to the computer as we know it today include such names as Napier (1612) – the inventor of logarithms; Pascal (1642) – the creator of the first gear-driven calculating machine\*\*. It added numbers entered with dials. Calculating devices in use today closely resemble Pascal's machine.

In 1671 Gottfried Wilhelm von Leibniz improved on Pascal's machine. He invented a special mechanism, which is still used in many modern day calculators.

Ch.X.Thomas created the first successful mechanical calculator that could add, subtract, multiply and divide.

Jacquard (1801) developed the punched-card principle followed by Hollerith's (1800) "unit record" principle by which data were coded and represented by holes in cards. He developed an automatic sorting machine, a cardpunch machine and semiautomatic tabulating machine. He organized "The Tabulating Machine Company" which with some other companies became the International Business Machines Corporation in 1924 (the famous IBM).

By 1890 the range of improvements included accumulation of partial results, storage and automatic reentry of past results (a memory function), printing of the results.

Ch. Babbage (1850) a mathematics professor in Cambridge constructed large-scale calculating machines when he realized that many long calculations were really a series of predictable actions that were constantly repeated. He called his automatic mechanical calculating machine a difference machine. The difference machine was really a great advance. Babbage continued to work on it for 10 years but then he started to work at the construction of a fully program-controlled, automatic mechanical digital computer. He called this idea an Analytical Engine, but failed because the necessary parts couldn't be manufactured precisely in his time. Despite failures, his work made a valuable contribution to the later engineering of calculating machines.

Between 1850 and 1900 great advances were made in mathematical physics and it came to be known that most observable dynamic phenomena can be identified by different equations (which meant that most events occurring in nature can be measured or described in one equation or another).

### **Notes:**

\*in existence – существуют

\*\*first gear-driven machine – машина, работающая по принципу зубчатой передачи

## **Part II**

***Read the text paying attention to different generations of computer and their features.***

### **GENERATIONS OF COMPUTER**

*First Generation Computers (1954-59)* were rather bulky in size, required large amounts of air conditioning and repair time also. The important advantages over earlier machines were speed of calculation, use of the stored program, the ability to apply logical decisions to calculated results, various types of input and output equipment, magnetic tape, paper tape, ability to modify its own program, etc.

*Second Generation Computers (1959-64)* replaced the vacuum tubes with the tiny transistor, thus requiring less power and offering greater reliability. High-speed card readers and printers were introduced. Symbolic programming was replacing machine language programming during this period. Random access devices were introduced. Repair and maintenance time was greatly reduced.

*Third Generation Computers (1964-70)* were characterized by advanced miniaturization and refinement of computer components. Greater compilers, newer and faster methods of input and output, optical scanners, magnetic ink character readers, data transmission over long distances, displays on video tubes, multiprogramming, tremendous storage capacities, remote terminals with access to central computers – innovations introduced during this period.

*Fourth Generation Computers (1970-1980)* featured many changes in all sectors of the computer field. The concept of “Virtual Storage” increased the main storage capabilities of computers by allowing a computer to directly access outside storage devices as though they were part of main storage. The minicomputer made spectacular advances during this period.

*Fifth Generation.* In the 1980s very large scale integration (VLSI), in which hundreds of thousands of transistors were placed on a single chip, became more and more common.

The “shrinking” trend continued with the introduction of personal computers (PCs) used by individuals. By the late 1980s some personal computers were run by microprocessors that could process about 4000000 instructions per second.

The new generation, the so-called “fifth” generation is using new technologies with new programming languages capable of amazing feats in the area of artificial intelligence.

## COMPREHENSION CHECK

**Exercise 1.** *Match the following words (a, b, c...) with the statements (1, 2, 3...).*

- a) Abacus
- b) Babbage
- c) First Generation Computer
- d) Fourth Generation Computer
- e) Jacquard, Hollerith
- f) Pascal
- g) Second Generation Computer
- h) Third Generation Computer

- 1. Inventor of the first calculating machine.
- 2. Earliest known calculating device.
- 3. Bulky in size, requiring large amounts of air conditioning and having a high maintenance rate.
- 4. Developed punched card principle used in automatic looms.
- 5. Allows computer to direct access outside storage devices.
- 6. Replaced vacuum tubes with transistors.
- 7. Advanced miniaturization and refined computer components.
- 8. Invented large scale calculators.

**Exercise 2. Answer the questions.**

1. Who originated the ABACUS and what important contributions did it make to the data processing field?
2. What were the significant developments in the data processing field during the 17<sup>th</sup> century?
3. What important contributions did Babbage make to the field of data processing?
4. Who developed the punched card principle?

**LANGUAGE ACTIVITY**

**Exercise 1. Insert articles where necessary.**

1. Computer program of ... future will probably be quite different from those in ... use today.
2. It will be ... interesting future – waiting for each new development and marveling at each new advance in data processing.
3. Every home could have ... built-in communications system, similar to ... cable television.
4. A built-in communications system will allow ... user to have ... world's information at his immediate disposal without leaving his home.
5. ... programming as we know it may cease to exist.

**Exercise 2. Summarize your knowledge on the use of the Perfect Tenses. Translate the sentences.**

1. Biochemists have found a physical limit to the information they can obtain with their instruments.
2. Computers have been especially valuable in analyzing the signals from outer space.
3. Scientific research has moved into the foreground of human activity.
4. The achievements of computers in all sciences have been fantastic.
5. The object of this text has been to show the usage of computers in various sciences.

**Exercise 3. Summarize your knowledge on modal verbs and their equivalents. Translate the sentences.**

1. Computers must be available to everybody nowadays in Russia.
2. We can see the character of the job in data processing changing.
3. Programming problems and hardware technology will have to give way to preoccupation with service.
4. The necessary parts for Babbage's Analytical Engine couldn't be manufactured precisely in his time.
5. Every home can have a built-in communication system and the users are allowed to have the world's information at their disposal.

**Exercise 4. Choose the correct translation of the Russian phrases, paying attention to the Subjective Infinitive Constructions.**

1. Сообщили, что движение изменилось ....	<ul style="list-style-type: none"> <li>a) They reported that the change of the motion ....</li> <li>b) The motion is reported to have changed ....</li> <li>c) The motion was reported to have changed ....</li> </ul>
2. Полагают, что проблему решат ....	<ul style="list-style-type: none"> <li>a) They assumed that to solve this problem ....</li> <li>b) The problem is assumed to be solved ....</li> <li>c) To solve this problem they assume....</li> </ul>
3. Ожидали, что объект движется ....	<ul style="list-style-type: none"> <li>a) The object was expected to move ....</li> <li>b) They expected the object moved ....</li> <li>c) As they expected the object to move ....</li> </ul>
4. Говорили, что человек представляет ....	<ul style="list-style-type: none"> <li>a) The man represented ....</li> <li>b) The man was said to represent ....</li> <li>c) The man is said to represent ....</li> </ul>
5. Известно, что теория применяется на практике ....	<ul style="list-style-type: none"> <li>a) They applied theory in practice.</li> <li>b) Theory was applied in practice.</li> <li>c) Theory is known to be applied in practice.</li> </ul>

**SUPPLEMENTARY TEXTS**

**TEXT 1**

*Read the text and find the most important sentence – the main idea of the text.*

**HISTORY OF DATA PROCESSING**

The computer didn't just "happen" along during the last twenty-five years but is the result of thousands of years of development and research.

Computing can be traced back to the primitive tribes. Ancient calculating involved the manipulation of the fingers to represent various numbers. The first data processing tools were used to facilitate counting. Variations and refinements of counting led to fairly elaborate calculators involving addition, subtraction, multiplication and division. As man continued to work with numbers and the demand for information increased, more complex devices were developed. The computer is the culmination of thousands of years of research to develop a machine capable of processing data at high speeds with self-checking.



## TEXT 2

***Read the text. Be ready to speak on: 1) digital computer; 2) analog computer.***

Computers can be either digital or analog. Digital refer to the processes in computers that manipulate binary numbers (0s or 1s), which represent switches that are turned on or off by electrical current. Analog refer to numerical values that have a continuous range. Both 0 and 1 are analog numbers, but so is 1.5 or a number like  $p$  (approximately 3.14). As an example, consider a desk lamp. If it has a simple on/off switch, then it is digital, because the lamp either produces light at a given moment or it does not. If a dimmer replaces the on/off switch, then the lamp is analog, because the amount of light can vary continuously from on to off and all intensities in between.

Analog computer systems were the first type to be produced. A popular analog computer used in the 20<sup>th</sup> century was the slide ruler. It performs calculations by sliding a narrow, gauged wooden strip inside a rulerlike holder. Because the sliding is continuous and there is no mechanism to stop at one exact value, the slide rule is analog. New interest has been shown recently in analog computers, particularly in areas such as neural networks that respond to continuous electrical signals.

## TEXT 3

***Read the text and make up a short summary.***

### HISTORY OF PROGRAMMING LANGUAGES

"First things first: the very first language  
*a programmer should learn is English.*"  
Stig Hemmer

Programming language is a composition of vocabulary and set of grammatical rules for instructing a computer to perform specific tasks. Each language has a unique set of keywords\* (words that it understands) and a special syntax for organizing program instructions.

*Machine languages* are the languages that the computer actually understands. They are the least complex and the closest to computer hardware programming languages. They consist entirely of numbers, and only numbers, — memory addresses and operation codes. Each different type of CPU (Central Processing Unit) has its own unique machine language.

Lying between machine languages and high-level languages are languages called assembly languages.

*Assembly languages*, or assemblers are similar to machine languages, but they are much easier to program in because they allow a programmer to substitute names for numbers: ones and zeros and enable them to use meaningful names for

instructions. In fact, the first assembler was simply a system for representing machine instructions with simple mnemonics\*\*.

But most often the term programming language refers to *high-level languages*, such as BASIC, C, C++, COBOL, FORTRAN, Ada, Pascal, etc.

High-level programming languages are more complex than assemblers and much more complex than machine languages. They all fall into two major categories: imperative languages and declarative languages.

*Imperative languages* describe computation in terms of a program state and statements that change the program state. Imperative programs are a sequence of commands for the computer to perform.

The earliest imperative languages were the machine languages of the original computers. In these languages, instructions were very simple. FORTRAN, Formula translation developed at IBM starting in 1954, was a compiled language that allowed named variables complex expressions, subprograms, and many other features now common in imperative languages.

*Declarative programming languages* stand in contrast to imperative languages. Whereas imperative languages give the computer a list of instructions to execute in a particular order, declarative programming describes to the computer a set of conditions and relationships between variables, and then the language executor (an interpreter or compiler) applies a fixed algorithm to these relations to produce a result. The advantage of declarative languages is that programs written in them are closer to the program specification. Programming, therefore, is at a higher level than in the imperative languages.

**Notes:**

\*keywords – ключевые слова

\*\*mnemonics – символы, вызывающие определенную ассоциацию

**Exercise 1. Give definitions to the following:**

1. Programming language is...
2. Machine languages are...
3. Assembly languages are...
4. High-level programming languages are... .

**Exercise 2. Make a summary of the text.**

## Unit II

### WORD-STUDY

#### *Word and word combinations to be remembered.*

method of compiling - метод сборки

utilization – использование

extrapolate – извлекать

trial – проба

yield - приносить, давать

pattern – образец

#### **Exercise 1. Match the synonyms.**

1	2
1. utilization	a) achievement
2. quantity	b) use
3. advance	c) amount
4. boundless	d) weather prediction
5. trial	e) unlimited
6. weather forecast	f) to result
7. to require	g) test
8. drug	h) to demand
9. to yield	i) medicine
10. safe	j) harmless
	k) quality

#### **Exercise 2. Pay attention to the explanations of the terms.**

1. Data processing - doing calculation needed to deal with given information.  
The central unit of a computer processor is used for it.
2. Storage - a special device in a computer for keeping information.
3. Pure sciences - deal with theories.
4. Applied sciences- deal with practical application of scientific research.

## TEXT II

### Comprehensive reading

*Read the text, translate it and choose the sentences covering the main idea of the text.*

## COMPUTERS IN SCIENCE

Computers are perhaps the most useful tools ever invented by mankind. In this, the era of computers, they are used to count our votes, figure our bank accounts, help plan new buildings and bridges, guide our astronauts through space and assist management in its everyday decisions.

The dynamic introduction of the computer has changed man's information needs entirely. Man has developed methods of compiling and analyzing large quantities of data with a minimum amount of human intervention. Technological advances in all fields have been dynamic and extensive. The methods of applying data processing systems to information needs are boundless. With each new application, data processing systems can be used to help man increase his productivity and advance civilization further. It's a giant step forward in man's utilization of science and knowledge as a means of progress.

What can computers do for the scientist? Now weather scientists are able to work out astronomical number of calculations for predicting weather changes. They are even working on a mathematic model of the world's weather that may some day enable us to make accurate weather forecasts a year or more ahead of time.

In medicine computers are helping researchers test drugs by extrapolating the information gained in limited trials, so that large scale tests will not only be safer, but will yield far more useful information. Computers are helping doctors make diagnoses by winnowing down the information a doctor has to go through to arrive at a valid conclusion.

Biochemists are using computers as a sort of mathematical microscope, in delving into the secret of the living cell; they have found a physical limit to the information they can obtain with their instruments. By using computers they have already obtained and are beginning to construct an accurate picture of the giant molecules that are the building blocks of all living things.

In astronomy, computers, of course, serve as computational workhorses, figuring out the exact positions and orbits of planets, stars and other heavenly bodies. With the growing importance of radio telescope, computers have been especially valuable in analyzing the patterns of signal received from outer space, separating the meaningful signals from the electronic roar of background "noise" that accompanies them.

Space technology would be almost unthinkable without the power of the computer. This is an area of science that requires the combined knowledge of all other sciences - physics, chemistry, thermodynamics, electronics, mathematics, even psychology. Only computers can bring this large amount of information under control to make it serve our efforts.

The achievements of computers in the fields of space exploration, weather reporting, medical, research and other areas of scientific study have been fantastic. The tremendous storage capacities and rapid processing of data have produced the valuable information necessary for research in the unknown areas of science. Scientific research has moved into the foreground of human activity. In both the pure and applied sciences, computers are being used to multiply man's thinking power - and to multiply the time he can spend thinking.

## **COMPREHENSION CHECK**

**Exercise 1. Answer the following questions.**

1. How is our era characterized in the text?

2. What are computers used for in everyday life?
3. How do computers help researchers in medicine?
4. What are biochemists using computers for?
5. What do computers serve in astronomy for?

**Exercise 2.** *Name the sciences where computers are very useful tools.*

**Exercise 3.** *Agree or disagree to the following statements. Begin your sentences with the following phrases: I think so. Yes, it's really so. I'm afraid, it's wrong. I can't agree.*

1. The computer has changed men's information needs entirely.
2. Computers help scientists in all fields of knowledge.
3. Computers will be able to work without a man.
4. The methods of applying data processing systems are limited.
5. All scientists use computers in their work.

## LANGUAGE ACTIVITY

**Exercise 1.** *Insert articles where necessary.*

1. ... computers are perhaps ... most useful tools ever invented by mankind.
2. Computers are working on ... mathematical model of world's weather.
3. Data processing is ... giant step forward in man's utilization of science and knowledge.
4. ... dynamic introduction of ... computer in ... last quarter of the last century has changed man's information needs entirely.
5. ...methods of ... applying data processing systems to information needs are boundless.

**Exercise 2.** *Insert prepositions where necessary (without, of, in, for, by).*

1. Technological advances ... all fields ... data processing have been dynamic and extensive.
2. ... medicine computers are helping researchers test drugs ... extrapolating the information gained ... trials.
3. What can computers do ... the scientist?
4. Space technology would be almost unthinkable ... the power ... the computer.
5. Space technology requires the combined knowledge ... almost all the other sciences.

**Exercise 3.** *Analyze the forms and functions of the Infinitive and translate the following sentences.*

1. To figure out bank accounts people use computers.
2. To bring the large amount of information under control scientists use the possibilities of computers.
3. To predict weather changes weather scientists work out astronomical number of calculations.

4. To obtain an accurate picture of living molecules is important for biochemists.
5. To apply computers in both the pure and applied sciences means to multiply man's thinking power.
6. To make accurate weather forecasts is sometimes very difficult.
7. The method to be applied will help to process data.
8. Computer scientists had several problems to solve.
9. The first country to develop a computer was the US.

**Exercise 4. Explain how scientists use computers in different fields. Start your sentences with the Infinitive to express the purpose of computer application.**

*Example: To figure out the exact positions and orbits of planets astronomers use computers.*

**Exercise 5. Make up complete sentences with different forms of the Infinitive and different subjects. Translate the sentences.**

*I. Example: The computer is known to calculate very fast.*

The scientists	is	known	to have invented a new method
The computer	are	considered	to have been solving the problem
	was	assumed	to be used everywhere
	were	reported	to be thinking over the task
		stated	to have been used in the investigation
		supposed	
		found	
		expected	

*II. Example: I supposed him to succeed.*

I	assume	him	to	arrive
We	believe	computer	-	be thinking
	consider	my friends		work hard
	expect	scientists		succeed
	know			have obtained
	suppose			investigate
	want			be helped
	see			have been
	hear			used
	watch			
	make			
	let			

**Exercise 6. Translate the sentences from Russian into English using the Infinitive or Infinitive Constructions.**

1. Известно, что биохимики используют компьютер как своеобразный математический микроскоп.
2. Чтобы обрабатывать большое количество информации ученые используют современные методы.

3. Ожидается, что возможности человека будут увеличиваться.
4. Чтобы добиться успеха в космических технологиях необходимо объединить знания химии, физики, термодинамики, электроники, математики.
5. Использовать компьютер – значит уменьшить время решения задачи.
6. Считается, что компьютер – одно из самых полезных изобретений человечества.
7. Мы видим, как мир изменяется благодаря новым технологиям.

## **SUPPLEMENTARY TEXTS**

### **TEXT 1**

*Read the text and prove that the title reflects the main idea of it. Choose the most important information.*

### **THE FUTURE OF COMPUTERS**

Automatic programming continues to improve, improvement in input and output devices, greater use of video displays, miniaturization of computer hardware, computers that can respond to the spoken word, integrated network of systems to transmit data from one system to another, the possible elimination\* of the paycheck, - are just a few of the new innovations being developed. The appearance of the “microcomputer”, a complete circuit on a single chip affects all aspects of our society. Education, consumer products, programming are just a few areas that will undergo change\*\* as a result of the impact of the “microcomputer”. Job characters will include psychological and sociological aspects of using the computer. Computer programs of the future will probably be quite different from those in use today.

**Notes:**

\*elimination – упразднение

\*\*to undergo change – подвергаться изменению

### **TEXT 2**

*Read the text and explain the meaning of the term Artificial Intelligence.*

### **AI TEACHING COMPUTERS**

The Artificial Intelligence Applications Institute has many projects that they are working on to make their computers learn how to operate themselves with less human input.

AUSDA is a program which will exam software to see if it is capable of handling the tasks. If it isn't able or isn't reliable AUSDA will instruct you on finding alternative software which would better suit your needs

EGRESS is a program which is studying human reactions to accidents. It is trying to make a model of how people's reactions in panic moments save lives. Although it seems like in tough situations\* humans would fall apart and have no idea what to do, it is in fact the opposite. Quick decisions are usually made and are effective but not flawless\*\*. These computer models will help rescuers make smart decisions in time of need. AI can't be positive all the time but can suggest actions which we can act out and therefore lead to safe rescues.

So AIAI is teaching computers to be better computers and better people. AI technology will never replace man but can be an extension of our body which allows us to make more rational decisions faster. And with Institutes like AIAI- we continue to step forward into progress.

**Notes:**

\*tough situation – стрессовая ситуация

\*\*flawless – безупречный

**Exercise 1. Answer the questions.**

1. What program is used for studying human reactions to accidents?
2. What is AIAI teaching computers to be?

**TEXT 3**

***Read the text and say what Apples are meant by the author.***

**NO WORMS IN THESE APPLES**

Apple Computers may not have ever been considered as the state of art in Artificial Intelligence, but a second look should be given. Not only are today's PCs becoming more powerful but AI influence is showing up in them. From Macros to Voice Recognition technology, PCs are becoming our talking buddies. Who else would go surfing with you on short notice- even if it is the net. Who else would care to tell you that you have a business appointment scheduled at 8:35 and 28 seconds and would notify you about it every minute till you told it to shut up. Even with all the abuse we give today's PCs they still plug away to make us happy. We use PCs more not because they do more or are faster but because they are getting so much easier to use. And their ease of use comes from their use of AI.

Speech Recognition. You tell the computer to do what you want without it having to learn your voice. This implication of AI in Personal computers is still very crude but it does work.

Script recognition. Cursive or Print can be recognized by notepad sized devices. With the pen that accompanies your silicon note pad you can write a little note to yourself which magically changes into computer text if desired. Your computer can



read your handwriting. If it can't read it though- perhaps in the future, you can correct it by dictating your letters instead.

Your computer does faster what you could do more tediously. You have taught the computer to do something only by doing it once. In businesses, many times applications are upgraded. But the files must be converted. All of the businesses records but be changed into the new software's type. Macros save the work of conversion of hundred of files by a human by teaching the computer to mimic the actions of the programmer thus teaching the computer a task that it can repeat whenever ordered to do so.

AI is all around us. Don't think the change will be harder on us because AI has been developed to make our lives easier.

**Exercise 1. *Answer the questions.***

1. What are Apple computers able to recognize?
2. What programs are used for it?

***Topics for discussion.***

1. *AI technologies of today.*
2. *AI technology will never replace man.*
3. *AI is all around us.*

## Unit III

### WORD-STUDY

#### *Words and word combinations to be remembered.*

button – кнопка

input device – вводящее устройство

output device – выводящее устройство

socket – гнездо

bus – шина, канал

flexible - гибкий

#### **Exercise 1. Memorize the main components of the computer:**

monitor, keyboard, mouse, system unit, CPU, motherboard, disk drives, video card

#### **Exercise 2. Read the collocations and their translation, remember them:**

hardware components - аппаратные части (компоненты)

software components – программные части (компоненты)

video information – видео информация

punctuation marks – пунктуационные отметки

processor socket – процессорное гнездо

memory socket – гнездо памяти

expansion slot – слот (разъем) расширения

serial and parallel ports – последовательные и параллельные порты

peripheral controllers – периферийные контроллеры

power supply – источник питания

system buses – системные шины

#### **Exercise 3. Match the synonyms.**

##### Verbs

1	2
1. contain	a) allow
2. store	b) keep
3. display	c) perform
4. permit	d) print
5. carry out	e) include
6. type	f) show
7. maintain	g) support
	h) produce
	i) include

## Nouns

1	2
1. instruction	a) use
2. program	b) channel
3. application	c) consumer
4. bus	d) command
5. user	e) digit
6. number	f) energy
7. power	g) routine
	h) monitor
	i) component

## TEXT I

### Comprehensive reading

*While reading and translating the text pay attention to the definitions of computer components.*

### COMPUTER COMPONENTS

A computer consists of a variety of hardware and software components that work together to perform calculations, organize data, and communicate with other components.

The main components of the computer:

Monitor - A monitor is an out device, which is responsible for conveying information to the user, which looks like a television screen, displays texts, graphics and video information.

Keyboard - A keyboard is an input device which allows the user to enter data and instructions into a computer. The keyboard contains keys that allow you to type letters of the alphabet, numbers, spaces, punctuation marks, etc. The keyboard also contains special keys for entering instructions.

Mouse - A mouse is a small hand held device that contains at least one button. The mouse controls the movement of a symbol on the screen called the pointer.

System Unit - A system unit is a box like case made from metal or plastic that protects the internal components of the computer from damage. The circuitry in the system unit is a part of or is connected to a circuit board called the motherboard.

The main components of the system unit:

CPU - A Central Processing Unit, also called a processor, is the electronic device that interprets and carries out the basic instructions that operate the computer. There are basically two types of processors i.e. slotted and socket processors. Many modern CPUs are covered with fins or a fan to dissipate the heat they generate.

Motherboard - A motherboard is the primary printed circuit board in a PC. All of the basic circuitry and components required for a PC to function are either contained

in or attached to the motherboard. The motherboard typically contains the system bus, processor and coprocessor sockets, memory sockets, serial and parallel ports, expansion slots, and peripheral controllers.

Bios - A BIOS (Basic Input Output System) is the program that enables a PC to boot after power-up. The BIOS is a built-in set of routines that serves as an interface between the computer's operating system and hardware devices. It is stored on an ROM chip generally located near the computer's real-time clock or lithium battery. By processing requests from applications as well as drivers, the BIOS permits the user to maintain control of hardware settings.

Disc Drives - On computer system one may have several different drives installed on his/her system. The following drives may be installed on a computer

Hard Drive - A hard drive is an important part of your computer, used for long-term storage of data, opposite to Random Access Memory (RAM) which loses data as soon as your PC loses power.

Floppy Disc Drive - A Floppy Disc Drive is used for storing information into a floppy disk. A floppy disk consists of a thin, circular, flexible disk enclosed in a plastic shell. It stores data and information using magnetic patterns.

A CD ROM/DVD ROM drive/CD RW - CD ROMs are a little bit different than floppy and hard disks. Instead of electromagnetism, they use a laser to reflect light off microscopic pits embedded in the disks. When a pit swings by, the light is reflected to an electric eye. Where there is no pit, the light is not reflected. DVD-ROMs store more data. They can do it by having smaller pits, using two levels of pits, one under a translucent surface containing the other layer, and in some cases, by storing data on both sides of the disk.

Video Card - One of the expansion cards, called a display, video or graphics card, is for the monitor. This card is responsible for converting graphics and text into the monitor.

Power Supply - An internal power supply is responsible for converting your standard household power into a form that your computer can use. The power supply is responsible for powering every device in your computer; if it has a problem or is of low quality you may experience many difficulties.

System buses - A bus, in computer terms, is simply a channel over which information flows between two or more devices.

Memory Module - Memory is a temporary storage place for data, instructions, and information.

## COMPREHENSIVE CHECK

**Exercise 1. Describe the functions of the following computer components:**

1. A processor
2. A motherboard
3. A video card
4. A keyboard
5. A mouse

6. A memory module
7. A monitor

**Exercise 2. Which of the following sentences are true?**

1. The motherboard contains a lot of sockets for different computer components.
2. Random Access Memory provides long-term storage of data.
3. A keyboard is an input/output device.
4. Monitors display different kinds of information.
5. CD- ROMs keep more data than DVD ROMs.
6. A BIOS is a part of the computer hardware.
7. Display, video or graphics cards are different names of the same device.
8. System buses carry information between different computer devices.
9. A mouse is a hand-held device that contains only one button.

## LINGUAGE ACTIVITY

**Exercise 1. Insert prepositions where necessary: (of, on, into, for, at, in, to)**

1. A monitor is responsible ... conveying information ... the user.
2. A system unit is a box made ... metal or plastic.
3. A mouse contains ... least one button.
4. Different drives may be installed ... a computer.
5. There are two types ... processor: slotted and socket.
6. Memory is a temporary storage place ... data.
7. The mouse controls the movement ... the pointer ... the screen.
8. All computer components are either contained ... or attached ... the motherboard.

**Exercise 2. Analyze the functions of the Gerund and translate the following sentences.**

1. Processing data is the main function of the unit.
2. By processing request from applications the BIOS permits to control hardware settings.
3. The idea of processing data automatically was very appealing.
4. They started processing immediately.
5. Without further processing the device can't be used anywhere.
6. His task was to organize processing as soon as possible.
7. The topic of their discussion was processing information in logical systems.

**Exercise 3. Translate the sentences. Pay attention to the forms of the Gerund.**

1. He hates interrupting people.
2. He hates being interrupted.
3. The designer insisted on testing the model.
4. We relied on being helped promptly.
5. The investigators are proud of having developed a new device.
6. They were pleased at having been awarded.

7. We look forward to establishing good relations with other companies.
8. The fact is worth considering.

**Exercise 4.** *Choose what preposition should be used after each verb listed below (of, to, for, on, from, in, -). Remember using gerund after them, translate them.*

to insist  
to depend  
to avoid  
to succeed  
to deny  
to rely  
to approve  
to prevent

**Exercise 5.** *Insert the proper verbs from exercise 4 and translate the sentences into Russian.*

1. They (настаивали) on our coming.
2. This company (преуспела) in producing personal computers.
3. He (одобрил) of using modern methods of investigation.
4. You should (избегать) ordering such products.
5. Nothing could (помешать) him from going there.

**Exercise 6.** *Translate the sentences paying attention to the forms of the Infinitive after modal verbs.*

1. The frequency must have been increased.
2. They can't have used the material in the construction of the device.
3. The scientists must be investigating the properties of the crystal.
4. The limit of performance might have been achieved.
5. They may be testing various types of lasers.
6. Small frequency shifts may have been detected.
7. Low-loss optical fibers must have been developed at this research center.
8. Chemists and biologists must have been studying molecular structures.
9. Can he have forgotten to turn off power supply?

## SUPPLEMENTARY TEXTS

### TEXT 1

*While reading the text find the necessary information to prove the title.*

### EVOLUTION IN SIZE

Computers come in all sizes. Large ones are called mainframes. The mainframes have been around the longest, and there are a lot of them, especially in larger organizations.

The most powerful computers, however, are called supercomputers. The supercomputers are so powerful that they are found in only a few of the larger business organizations. Supercomputers most often are used for scientific calculations.

The recent trend has not been to larger computers, but to smaller ones. In the 1970s, this trend got its start with minicomputers, or minis. These computers were smaller than the mainframes but, in many cases, outperformed the larger units.

The minis were received so well that computer manufacturers produced even smaller units – called microcomputers or micros. Most of the microcomputer's main circuitry is in the form of a small silicon chip, smaller than your fingernail. The chip is called a microprocessor.

You also hear terms like “small business computer” and “personal computer”. A small business computer is a mini or micro that is usually found in smaller firms and provides the computational support.

## **TEXT 2**

*Read the text and choose the right answer to the questions given below.*

### **MICROPROCESSOR AS A CPU**

We can also view the microprocessor as a primary component of a computer. Traditionally, the computer is represented in block of components: Memory, Input, Output, and the Central Processor Unit (CPU), which consists of Arithmetic/Logic Unit (ALU) and Control Unit. The CPU contains various registers to store data, the ALU to perform arithmetic and logical operations, instruction decoders, counters, and control lines. The CPU reads instructions from the memory and performs the task specified. It communicates with input/output devices either to accept or to send data. These devices are also known as peripherals. The CPU is the primary and central player in communicating with devices such as memory, input, and output. However, the timing of the communication process is controlled by the group of circuits called the control unit.

In the 1960s, the CPU was designed with discrete component on various boards. With the advent of the integrated circuit technology, it became possible to build the CPU on a single chip; this came to be known as microprocessor.

1. What component of a computer can be viewed as primary?

- a) the ALU
- b) the memory
- c) the CPU

2. Where does the CPU store data?

- a) in registers
- b) in counters
- c) in instruction decoders

3. What devices are called peripherals?

- a) the memory
- b) integrated circuits
- c) input/output devices

### TEXT 3

*Read the text and answer the questions.*

#### BILL GATES

Everyone has heard of Bill Gates, one of the richest and most successful people in the world. Microsoft, the business he started with a friend in 1975, has become the world's largest computer software company, and Gates was the world's youngest billionaire at the age of 31.

His full name is William Henry Gates III, and he was born on 28<sup>th</sup> October, 1955, in Seattle, USA. At school, Bill soon showed that he was very intelligent, and especially good at Maths and Science. His parents decided to send him to Lakeside, the private school where he first began to use computers. 13-year-old Bill Gates and his schoolfriend Paul Allen were soon spending all their time writing programs and learning about computers instead of doing their schoolwork!

After finishing school in 1973, Bill went to Harvard, America's most famous university. The next year, he and Paul Allen wrote an operating program for the Altair, one of the world's first microcomputers. The two friends started Microsoft in 1975, and Gates left Harvard. Before long, Microsoft was a major business success. Since then, the company has continued to grow, producing most of the world's leading PC software. One reason for his success is that Gates has always been very ambitious and hardworking. This has not left him much time for a normal personal life, but in 1994 he married Melinda French, a Microsoft employee, and in 1995 he wrote a best-selling book, "the Road Ahead".

Bill has mixed feelings about spending so much time running Microsoft. "There are a lot of experiences I haven't had, but I do like my job," he says. When he does find time to relax, he likes puzzles, golf and reading about science. For such a rich person, his life is simple, and he spends little on himself and his family. When it comes to helping others, though, Gates is very generous\*. He has already given huge amounts of money to charity and says that he plans to give away almost all of his wealth\*\* when he retires\*\*\*.

#### *Notes:*

\*generous – великодушный

\*\*wealth – богатство

\*\*\*retire – уйти на пенсию, отойти от дел

1. What is Bill Gates's full name?
2. What have he and Paul Allen done together?



3. Why has Gates been so successful?
4. What does he do in his free time?
5. What does he plan to do with all his money?

**Exercise 1. Complete the table.**

Full name:	William Henry Gates III
Born:	28 October, ..., in Seattle, USA
Early Life:	<ul style="list-style-type: none"> <li>• very intelligent, especially good at Maths and Science</li> <li>• parents sent him to Lakeside, a private school</li> <li>• finished school in ...</li> </ul>
Later Life:	<ul style="list-style-type: none"> <li>• went to Harvard</li> <li>• started Microsoft in 1975 (with Paul Allen), left Harvard</li> <li>• married Melinda French in ...</li> <li>• wrote “The Road Ahead” in...</li> </ul>
Character:	ambitious, hardworking, generous
Likes:	puzzles, golf, reading about science
Plans:	to give away almost all of his wealth...

**Exercise 2. Use the information of the text to talk about Bill Gates.**

**TEXT 4**

**Read the text and say in English what explanation of the term “server” is given in the text.**

Термин «сервер» толкуют по-разному. Иногда его относят к оборудованию, а иногда - к ПО (Программное оборудование). В некотором смысле оба этих определения относятся к архитектуре отвечающей на эти запросы путем выдачи информации заданного типа. Разумеется, в обоих случаях ядром системы является соответствующее ПО. Когда об оборудовании говорят как о сервере, обычно имеют в виду, что на чем работает одна или более серверных программ, что он может быть предназначен для той или иной роли и, возможно, состоит из компонентов, обеспечивающих высокую степень готовности. Вообще говоря, слово «сервер» имеет тот же корень, что и «сервис». Таким образом, с точки зрения аппаратных средств сервер — это компьютер, который способен оказывать некоторые услуги другим, подсоединенным к нему компьютерам. Подразумевается, что компьютеры каким-то образом связаны с сервером и друг с другом.

Правильный выбор сервера для организации - нелегкая задача. Широкий ассортимент серверных систем требует от руководителей ИТ-служб реалистичной оценки требований к их вычислительной мощности, надежности

и степени готовности. Они должны четко сформулировать, каковы будут требования к серверам, изучить возможности сервисной поддержки, а также определить будущие затраты на модернизацию. Кроме того, надо хорошо ориентироваться в разнообразии предлагаемой на рынке продукции.

## UNIT IV

### Exercise 1. Check the transcription of the following words:

#### Nouns

circuit, encyclopedia, establishing, investigator, authority, reference.

#### Verbs

wheeze, search, accept, specialize, announce, participate.

#### Adjectives

exhaustive, famous, exclusive, thematic, absolute, reliable.

### Exercise 2. Give the Russian equivalents to the following words without using a dictionary.

Astronomy, instrument, observatory, information, principle, computers, universal, encyclopedia, section, transistors, exclusive, laboratory.

### Exercise 3. Match the synonyms.

1	2
1. evolution	a) establishing
2. explorer	b) well-known
3. installing	c) development
5. famous	d) accept
5. allow	e) investigator
6. receive	f) submit
7. search	g) consist
	h) permit
	j) look for

### Exercise 4. Make nouns from the following verbs according to the model and translate them.

*Verb + tion Model: install – installation*

instruct, communicate, miniaturise, inform, specialise, form, alter, educate, occupy, qualify, invent, oppose, pollute, produce, reduce.

*Verb + ment*

announce, improve, achieve, employ, excite, enjoy, advertise, manage.

*Verb + ee*

employ, pay, refuge, address.

## TEXT I

### Comprehensive reading

#### Exercise 1. Read the text and express your opinion about Internet.

## WHAT IS INTERNET?

Wherever you were, whatever you read, see or hear you can meet information about Internet.

Whether you worked in the sphere of education or business, whether you were an employee of some official body, whether you worked with a computer you were probably once or twice asked: “What is your address in the Internet?”

So what is Internet? Why has this global network suddenly appeared? How many people use Internet? In what directions does Internet develop?

Answers to these questions allow experts to develop this extremely important communication system.

There are three stages of computer development.

1. The era of the “Black box” (1939 – 1970).

That time computers represented the huge weight of electronic lamps, transistors or integrated circuits. They also filled huge black metal boxes. If you smoked or raised voice, they wheezed and stopped. IBM firm manufactured the majority of them.

2. The era of personal computers (1970 – 1990).

The invention of microcircuits and new operational systems meant that computers of cheaper and smaller sizes could perform the larger amount of work faster. Miniaturization and improvement of program maintenance have given computers at disposal of small business and families. By the end of this period the majority of people used programs of Microsoft firm.

3. The era of the Worldnet (1992).

The beginning of Internet was necessary for the defensive industry, and for investigators of the academic laboratories and computer communication network. There were dozens of experts in the USA, in the UK, and Norway who were true explorers of Internet.

The new communication facility became popular when operators started to send messages to each other to exchange new ideas and to discuss general scientific problems. It was e-mail.

Internet is the largest communication network in the world. Recently some sources have been approved and now Internet connects more than 40000 various networks in more than one hundred countries. Imagine, that over 5 million main computers participate in Internet and service 40 million users all over the world.

However, it is very difficult to define real number of users to say how widely Internet is distributed. Nobody operates this network. It has no management establishing, the instructions for use, and allocated authority to introduce them.

Internet extends faster and faster. It is easier to speak about how Internet has grown for years from the moment of its appearance than to name the exact amount of its users.

Internet is frequently considered by beginners as a big information “dump”\*. But to help them with huge amount of facts there are various search systems, thematic sites etc. There are also such collectors of the information as encyclopedias. Due to\*\* them, you do not need to search for the necessary information on the sites. It is only

necessary to find the thematic encyclopedia interesting to you and the address taken from Internet, and to read everything on the given theme. In the network there are both universal and specialized encyclopedias.

As an example it is possible to take Cyril and Mephody's site. Here you can find the encyclopedia and, besides 25 thematic sections. Search is conducted according to the thematic word or a word collocation. As a result you receive references to the thematic sections and then the articles in the encyclopedia. For example, at input of a word "mouse" articles from sections "Animals" and "Computers" will be offered to you.

Besides on a site you have an opportunity to take part in the conference. At your disposal there is a board of announcements\*\*\*, the information on news, weather, currency. It is possible to say that it is the best in Russia Internet encyclopedia. All its articles are absolutely exclusive.

Other example is Britannica. It is huge universal English-speaking encyclopedia. It is submitted without reductions. The encyclopedia consists of two parts: "Macromedia" and "Micromedia". First, you receive the brief information from "Micromedia", and then if it is necessary, from "Macromedia". Numerous references to the articles from books and magazines allow you to receive the exhaustive information on your question.

### **Notes:**

\*information "dump" – информационная свалка

\*\*due to - благодаря

\*\*\*a board of announcements – доска объявлений

## **COMPREHENSION CHECK**

### **Exercise 1. Answer the following questions.**

1. What is Internet and in what spheres of life can you use Internet?
2. What are the main stages of computer development?
3. What kind of communication facility became popular among scientists when they exchanged ideas or discussed problems?
4. What kinds of encyclopedias can be met in Internet?
5. What are the user's opportunities while working with Internet?

### **Exercise 2. Agree or disagree with the following sentences.**

1. Internet is the global network used in the sphere of education, business, science that gives opportunities to exchange information, find exclusive articles on the questions etc.
2. First computers represented the huge weight of the electronic lamps, transistors and integrated circuits.
3. The majority of programs were produced by IBM firm in 1970-1990.
4. Arpanet is the largest network in the world now.
5. Internet has management establishing and instructions for use, and allocated authorities to introduce them.

6. Internet is frequently considered by beginners as a big information “dump”.
7. Internet presents absolutely exclusive information.

## LANGUAGE ACTIVITY

### Exercise 1. *Fill in the gaps with prepositions (of, in, by).*

When Charles Babbage, a professor... Mathematics...Cambridge University, invented the first calculating machine...1812 he couldn't imagine the situation we find ourselves today. Nearly everything we do...the world done, or even controlled...computers, the complicated descendants...his simple machine. Computers are used more and more often...the world today...the simple reason that they are far more efficient than human beings. They have much better memories and they can store much information. No man alive can do 50000 sums...one second, but a computer can...fact, computers can do many...the things we do, but faster and better. They can predict weather, and even play chess, write poetry or compose music.

### Exercise 2. *Summarize your knowledge on the Conditional Sentences.*

#### *I. Translate the sentences into Russian.*

1. If the evolution of AI proceeds so rapidly, it will be able to solve almost any problem arisen.
2. If we asked the computer to estimate possible results of our activity, it would give us a reliable answer.
3. Surely, they would have done much more, if they had the last model of computers.
4. If I had enough money, I would buy the newest model of computers.
5. Should I be late, begin the negotiations without waiting for me.

#### *II. Put the words in brackets into correct form.*

1. If a computer can answer some questions better and quicker than a man can do, it (to be) a man who formulates the questions.
2. If you asked what a software is, I (to note) it is “an applied thought”.
3. It's obvious that if there (to be) no computers, the progress of civilization wouldn't be so rapid.
4. Producing of computer memory working model would have been possible in 1939, if many people (to credit) the invention.
5. If there were no software but hardware only, computers (to represent) machinery that can do nothing by itself.
6. If Herbert Simon and Alan Newell hadn't succeeded in creating logic theories, someone else (to do) it.
7. If there is no adequate software, no computer (can) be used.
8. Had you backed up my opinion, the outcome (to be) more successful.
9. Was it permitted to our group to carry out the investigation, we certainly (to finish) it on time.

### Exercise 3. *Complete the sentences.*

1. If I were a genius ... .

2. If my father was a tycoon of computer industry ...
3. If my girlfriend were a hacker ...
4. If I had \$ 1000000 to spend in three days ...
5. If somebody stole my computer ...

**Exercise 4. Complete the real conditional sentences (I type) using given information. Begin each sentence with the words: “If the computer industry continues to grow...”.**

*Example: There may be as many as 80 million personal computers by the year 2008. If the computer industry continues to grow there will probably be as many as 80 million personal computers.*

1. Students may take courses on home computers.
2. Universities may be abandoned.
3. Work may be done at home.
4. Cities as we know them may become a thing of the past.
5. Books may become obsolete.
6. News from magazines may be available even before it is printed.
7. People who work long hours on computers may develop different personality traits.
8. People may become more isolated.
9. People may expect friends to respond as computers do.
10. Banking may not be done in person.
11. Medical diagnoses may be done by computers.
12. Tiny computer implants containing a great deal of information may be placed into the brain.
13. Computers may replace workers.

**Exercise 5. Translate the sentences paying attention to the usage of the Present Perfect Continuous.**

1. I have been working on the program for a month.
2. I have been living here since childhood.
3. He has been learning English for two years.
4. My friend has been programming for ages.
5. They have been investigating this strange phenomenon for a long time but can't find any explanation.
6. How long have you been experimenting with this new device?
7. I have been looking for this dictionary everywhere but can't find it.

**Exercise 6. Translate the sentences paying attention to the usage of the Past Perfect Continuous.**

1. I had been working on the program for a month by that moment.
2. I had been living in Rostov for two years before our family moved to St. Petersburg.
3. I had been writing my letter for half an hour when he came.

4. By the time the problem was solved they had been experimenting with many materials for a long time.
5. He had been phoning her for 15 minutes before she answered the call.

## SUPPLEMENTARY TEXTS

### TEXT 1

#### **Exercise 1. *Read the text and entitle it.***

Although machines have been around for a long time and people have adapted easily to living with most of them, they haven't yet learned how to live in harmony with the newest of these: the personal computer. This is so because the widespread use of the personal computer is a relatively new phenomenon.

There was the widely published case of a family man, who became so enamoured of his computer that he spent long hours with it. Of course, if he was spending long hours with his computer, he was spending less time with his family. And if his wife needed to see him, he was unavailable. She became so upset by this state of affairs that she delivered an ultimatum, declaring that unless he spent fewer hours with the machine and more with her and the family, she was going to divorce him. This issue became so serious that the couple had to go to the psychiatrist to resolve it. The fortunate outcome was that the husband reduced the time he spent with the computer, and the marriage was saved.

Some computer operators complain of their tendency to transfer to people the expectations they have of their machines. This happens because if an operator gives the machine instructions, it complies with no complaint. But if an operator treats his human friends as he treats his machine "friends", he may expect them to react with the alacrity\* and complete compliance characteristic of the machine.

Personal computers may cause people to become isolated from one another since work can be done at home alone. In this case, there may be no need for offices, or for that matter, for any other central gathering place. Universities, or even cities, could be abandoned. Moreover, if that which is now recorded in the computer instead, people will have no reason to use any paper whatsoever: no money, receipts, letters, newspapers, magazines, books, and so on. If this happens, there will be no need to go to the bank, the newsstand, the bookstore, or the library. Will people then be isolated in their separate dwelling\*\* - alone with their computers and their families, apart from fellow workers, readers, or students? But pause a moment! Once the isolation has come about, if indeed it does, will people opt\*\*\* to remain in this isolation, or will they react to it by seeking the companionship of others? If companionship is sought, might they not gravitate to cities after having fled from them? Even if they once attempted to work at home, if they have become tired of isolated lives with machines and few people, might they not congregate again in central gathering places? Most certainly, if the illegible\*\*\*\*, jumpy, green computer script hasn't been changed by that time, people will be forced, if only because of eye-strain alone, to flee from the computer and to seek other companions and diversions.



**Notes:**

\*alacrity – быстрота

\*\*dwelling – жилище

\*\*\*opt – выбрать

\*\*\*\*illegible - неразборчивый

**TEXT 2**

*Translate the following text.*

**TRANSLATING MACHINES**

There are many jokes about the uselessness of machine translation. The Control Intelligence Agency was said to have spent millions trying to program computers for translating from Russian into English. The best result was translation of the famous Russian proverb "The spirit is willing but the flesh is weak" into "The vodka is good but the meat is rotten". This story is a myth. But machine translation certainly produced its share of howlers and was too much relied upon.

Japanese researchers made energetic steps toward a reliable machine translation. Their efforts were imitated in the West.

The earliest "translation engines" were based on a direct, so called "Transformer" approach. Input sentences of the source language\* were transformed directly into output sentences of the target language\*\*. At first the machine did a rough analysis of the source sentence dividing it into subject-object-verb, etc. Then source words were replaced by target words selected from a dictionary and their order was rearranged according to the rules of the target language.

These rough operations were resulted in a simplified transformation with lots of silly sentences so much laughed at now.

Then came modern computers which had more processing power and more memory. Their translation engines are able to use "linguistic knowledge". It allowed to produce English-Japanese bank and succeed with "Tsunami" and "Typhoon" –the first Japanese – language – translation software to run on the standard (English) version of Microsoft Windows. Linguistic knowledge translators have two sets of grammatical rules – one for the source language and one for the target language. They also have a lot of information about the idiomatic differences between the languages to stop them making silly mistakes.

Having been designed from the start for use on a personal computer "Tsunami" and "Typhoon" use memory extremely efficiently. Their translating speed is more than 30.000 words per hour.

Do they produce perfect translations at a click of a mouse? Not at all. The machine translation comes at first to the hands of expert translators to get their teeth into\*\*\*. One mistake that the earlier researchers had made was to imagine that fully automated machine translation was possible.

**Notes:**

\*source language - язык оригинала

\*\*target language - язык перевода

\*\*\*to get teeth into - тщательно изучать

**Exercise 1. *Make up a short summary of the text.***

**TEXT 3**

***Read the text, translate it and answer the question of the title.***

**WHAT IS STEGANOGRAPHY?**

While we are discussing it in terms of computer security, *Steganography* is really nothing new, as it has been around since the times of ancient Rome. For example, in ancient Rome and Greece, text was traditionally written on wax that was poured on top of stone tablets. If the sender of the information wanted to obscure the message - for purposes of military intelligence, for instance - they would use *Steganography*: the wax would be scraped off and the message would be inscribed or written directly on the tablet, wax would then be poured on top of the message, thereby obscuring not just its meaning but its very existence.

According to Longman Contemporary English Dictionary *Steganography* (also known as “steg” or “stego”) is “the art of writing in cipher or in characters, which are not intelligible except to persons who have the key; cryptography” computer terms, *Steganography* has evolved into the practice of hiding a message within a larger one in such a way that others cannot discern the presence or contents of the hidden message. In contemporary terms, *Steganography* has evolved into a digital strategy of hiding a file in some form of multimedia, such as an image, an audio file or even a video file.

## UNIT V

### WORD-STUDY

#### *Words and word combinations to be remembered.*

dissemination – распространение

installation – установка

customer – покупатель, потребитель

erroneous opinion – ошибочное мнение

interactive stories – интерактивные истории

build-in global audience – глобальная аудитория сети

#### **Exercise 1. Check the transcription in the dictionary and read the proper words below:**

##### *Nouns*

adherent, agency, client, colleague, comprehensibility, medium, product

##### *Verbs*

to ignore, to range, to accept, to receive, to evaluate

##### *Adjectives*

frequent, spiritual, comprehensible, valuable.

#### **Exercise 2. Make different parts of speech from the following words according to the model.**

*Verb + tion = noun*

distribute, install, evaluate, present.

*Verb + ible/able = adjective*

comprehend, understand, program

*Adjective + (il) ity = noun*

capable, comprehensible, possible

*Adjective + ly = adverb*

graphical, full, frequent, expensive, like, public

#### **Exercise 3. Match the synonyms.**

##### *Verbs*

1	2
1. update	a) use
2. comprehend	b) turn on
3. employ	c) modernize
4. offer	d) be useless
5. click on	e) understand
6. link up	f) present
7. supply	g) connect
	h) propose
	i) provide

## TEXT 1

*The italicized sentences are to be translated into Russian in written form.*

### USES OF THE WEB

The fact that the Web is being widely used for multiple purposes is without question. But before overviewing its benefits it is worth considering one fact that became crucial event for it. The question is about a new mode of presenting information. Before, over the Internet and other wide area networks, the text has been the main mode of presentation. The Web changed that. Now the information could be presented in graphical format, complete with font choices and incorporated drawings, photographs, tables and other multimedia elements. These graphical elements offered different kinds of information and information providers were able to search precisely the element. *The result of these innovations is that the Web's capabilities are increasing, its information becomes more comprehensible too.* Of course the work has to be done right and those who care about their information perfectly know how to do it.

One of the first to use Web was science. Dissemination of research and scientific discoveries have always been one of the purposes of the Internet and of the Web project at CERN in Switzerland. Today the Web is used as a tool of exchanging scientific information as it has been considered to do. *But perhaps more important is that the Web is used to make research discoveries available to the general public, most of this information being presented so that it becomes as easy understandable as possible.* Publicly funded research agencies are interested in making their work known to the public, in finding new ways to place information. Booklets and pamphlets distributed through mailing are expensive and usually ignored. The Web is the best way out of the problem. Now on a well-designed HTML\* page a user can demonstrate its activities graphically and these pages can be updated inexpensively and frequently.

Providing services for clients as to technical documents, software patches and answers to frequently asked questions is another benefit of the Web using. Customers with a Web access are able to take care of their own information needs without resorting to the help of supplier's support staff.

Many other services of this kind are likely to be developed for making the Web more friendly to users. For example, the possibility of Web based tutorials are offering step-by-step procedures for installation a new piece of equipment or for programming your VCR\*\*. *Well designed, this service is certain to be better than a usual, tech support phone call because it shows, rather than tells, the customer what to do and how to do.*

It should be noted that these Web applications are not a one-way link. Customers need to know that they are nor forgotten and that there is a place where they can learn from the experiences of other customers. It becomes possible due to HTML forms to provide a feedback and to answer questions on products. The latter is especially valuable in products ordering. Now there are many who are interested in this service

rendered by the Web, and it is despite of the discussion as to the Web's security for credit cards use.

Why is the Web shopping so attractive? Imagine you can find a variety of products ranging from the flowers to books for your music CDs, and all this by browsing through the Web and without leaving your home. Moreover, unlike home shopping on TV, you needn't sit through the other products that are of no use for you in order to find the item you have been looking for.

Shopping on the Web is like walking into a shopping mall (by the way, "mall" is the name given to many Web offerings). There is only one thing for the customer to do: click on the shop you want, turn on the online graphic to see a picture of the chosen product and address to the other forms page to do the ordering. Such services are expected to be more often used.

At last, such spiritual part of human activity as creative arts is not aside from the Web pages. People in creative arts are often regarded as adherent to traditional forms of arts and resistant to new technologies. However, it would be an erroneous opinion, because throughout the history people of arts have always been among the first to adopt new technologies to their work. Such examples as printing press or MIDI\*\*\* witness it.

Therefore, it is quite natural that the artists consider WWW to be a new medium suitable for presenting their works and for linking up with their colleagues. Now we see galleries of new visual art to appear online or the presentation of artworks that are asked to be evaluated by the Web users. As to creative writings, it becomes frequent on the Web and includes interactive stories, illustrated texts, and even Web-based drama. The Web attracts artists by an inexpensive way of presenting their work and a build-in global audience. This is something about which artists could only dream before.

Of course, there are some arts that couldn't be placed on Web sites. But it may be a matter of future.

### **Notes:**

\*HTML (Hypertext Markup Language) – язык HTML (стандартный язык, используемый для создания страниц WWW).

\*\*VCR (Video Cassette Recorder) – видеомэгаффон

\*\*\*MIDI (Musical Instruments Digital Interface) – цифровой интерфейс музыкальных инструментов (стандарт сопряжения электронных музыкальных инструментов с компьютером и программным обеспечением)

## **COMPREHENSION CHECK**

### **Exercise 1. Answer the questions.**

1. What was the crucial event that enabled the Web to be widely used?
2. Why do the scientists use the Web so widely?
3. What services make the Web so user-friendly?
4. What other services, not mentioned in the text, could you describe?
5. Is Web-shopping really attractive or not?

6. What creative arts can be found today on Web pages?
7. What other arts might be placed on the Web sites in future?
8. Would you prefer to read fiction on a Web site or in a traditional way?

**Exercise 2. Arrange the sentences in their logical sequence using phrases: that is why, so, as a result, after, before, afterwards...**

1. Cruise lines have Web pages showing various types of cruises.
2. These pages offer information concerning tours and hotel accommodation as well as forms of transportation.
3. Planning a vacation becomes now much easier.
4. Many cities sponsor Web pages as well.
5. Many Web sites can help you in planning your travel or give you ideas of places you should visit.
6. You can learn about restaurants, sightseeing and shopping opportunities.

**Exercise 3. Read the text below. Use the word given in capitals at the end of each line to form a word that fits in the space in the same line. There is an example at the beginning (0).**

### NOT A COMPUTER WHIZZ-KID

I was *lazily* (0) browsing through the small ads in the local newspaper when I saw an... (1) for a second-hand word... (2), so I decided to give them a ring to get more... (3). I have a computer but it doesn't really have a... (4) enough memory for the project I'm involved in at the moment. In most... (5) nowadays, it is becoming useful to be "computer-literate" but in my... (6) it has become an absolute... (7). I must admit I do not get much... (8) out of sitting in front of a computer screen for hours, but I don't stand much of... (9) without computer skills. So I made an... (10) to see my bargain computer the next day.

*lazy*  
*advertise*  
*process*  
*inform*  
*power*  
*occupy*  
*profess*  
*necessary*  
*please*  
*promote*  
*appoint*

(advertisement, processor, information, powerful, occupations, profession, necessity, pleasure, promotion, appointment).

### LANGUAGE ACTIVITY

**Exercise 1. Translate the following sentences into Russian, paying special attention to the word "the latter":**

1. New forms of the text provided feedback to customers, the latter being especially valuable in products ordering.

2. The software may be used to send the contents of the screen to a speech synthesizer, and the latter converts the screen contents into spoken words.
3. With e-mail it becomes possible to send information and receive the answer almost immediately, the latter becomes especially beneficial for business decision-making.
4. The Internet has brought both financial and commercial benefits, the latter being especially important.

**Exercise 2. Choose the correct form of the verb according to the Sequence of Tenses.**

1. I knew that my friends (were waiting, are waiting) for me.
2. Professor said that the law (had been, has been) discovered by the end of the 19<sup>th</sup> century.
3. We were sure the new principles of higher education (will be, would be) proclaimed in our country.
4. The Dean said that the group (had passed, passed) all exams successfully.
5. The mechanical theory of heat states that heat (is, was) a form of energy.
6. The scientist informed the conference that they (have been studying, had been studying) the phenomenon for several years.
7. He knew that they (had come, came) to Moscow in 1995.
8. I saw he (was, is) very tired as he (has, had) been translating an article for a long time.
9. It was clear that it (was, is) time to go home.
10. He said he (has, had) written all the letters and asked me to post them.

**Exercise 3. Change the following sentences into the Reported Speech.**

1. The professor said: "The first transatlantic fiber optic cable was installed in 1988."
2. He said: "New achievements in fiber optics will take place in a year."
3. The student says: "I always get on well in studies."
4. The scientist replied: "The experiment will have been finished by 5 o'clock."
5. The doctor agreed: "The medical operation was successful due to laser usage."
6. She affirmed: "I have already read the article about holography."
7. The tutor asked: "Do you know the chemical formula of this substance?"
8. The inventor said: "In 1971 Dr Dennis Gabor was awarded the Nobel Prize in Physics for his discovery."

**Exercise 4. Convert the interrogative sentences into the Reported Speech.**

a) General Question.

1. My friend asked me: "Have you ever been at the freshmen physics lectures?"
2. The new assistant asked the adviser: "Will you allow me to be present at your lecture next week?"
3. The laboratory assistant asked the students: "Do you know what kind of work is going on in our lab?"

b) Special Questions

1. The student asked the Dean: "Who will be responsible for my undergraduate teaching?"

2. We asked a second-year student: “Where is professor N delivering lectures?”
3. The secretary asked our group: “What do you know about your regular courses in thermodynamics, quantum and statistical mechanics?”

**Exercise 5. Translate the following sentences paying attention to the tense forms in the Future Perfect Continuous Tense.**

1. I'll have been writing my test paper for some time when another student is given his task.
2. By the time you return from your business trip we'll have been exporting our products for a year.
3. They will have been discussing the new method for an hour before using it.
4. He will have been thinking it over and over again before making some definite decision.
5. I'll have been working on the program for a month by next Friday and I hope to finish it.

## SUPPLEMENTARY TEXTS

### TEXT 1

*Scan the text and say what computer-integrated manufacturing includes.*

### COMPUTER-INTEGRATED MANUFACTURING

Since about 1970 there has been a growing trend in manufacturing firms toward the use of computers to perform many of the functions related to design and production. The technology associated with this trend is called CAD/CAM, for computer-aided design and computer-aided manufacturing. Today it is widely recognized that the scope of computer applications must extend beyond design and production to include the business functions of the firm. The name given to this more comprehensive use of computers is computer-integrated manufacturing (CIM).

CAD/CAM is based on the capability of a computer system to process, store, and display large amounts of data representing part and product specifications. For mechanical products, the data represent graphic models of the components; for electrical products, they represent circuit information; and so forth. CAD/CAM technology has been applied in many industries, including machined components, electronic products, and equipment design and fabrication for chemical processing. CAD/CAM involves not only the automation of the manufacturing operations but also the automation of elements in the entire design-and-manufacturing procedure.

Computer-aided design (CAD) makes use of computer systems to assist in the creation, modification, analysis, and optimization of a design. The designer, working with CAD system rather than the traditional drafting board, creates the lines and surfaces that form the object (product, part, structure, etc.) and stores this model in the computer database. By invoking the appropriate CAD software, the designer can



perform various analyses on the object, such as heat transfer calculations. The final object design is developed as adjustments are made on the basis of these analyses. Once the design procedure has been completed, the computer-aided design system can generate the detailed drawings required to make the object.

Computer-aided manufacturing (CAD) involves the use of computer systems to assist in the planning, control, and management of production operations. This is accomplished by either direct or indirect connections between the computer and production operations. In the case of the direct connection, the computer is used to monitor or control the processes in the factory. Computer process monitoring involves the collection of data from the factory, the analysis of the data, and the communication of process-performing results to plant management. These measures increase the efficiency of plant operations. Computer process control entails the use of the computer system to execute control actions to operate the plant automatically, as described above. Indirect connections between the computer system and the process involve applications in which the computer supports the production operations without actually monitoring or controlling them. These applications include planning and management functions that can be performed by the computer (or by humans working with the computer) more efficiently than by humans alone. Examples of these functions are planning the step-by-step processes for product, part programming in numerical control, and scheduling the production operations in the factory.

Computer-integrated manufacturing includes all the engineering functions of CAD/CAM and the business functions of the firm as well. These business functions include order entry, cost accounting, employee time records and payroll, and customer billing. In an ideal CIM system, computer technology is applied to all the operational and information-processing functions of the company, from customer orders through design and production (CAD/CAM) to product shipment and customer service. The scope of the computer system includes all activities that are concerned with manufacturing. In many ways, CIM represents the highest level of automation in manufacturing.

## **TEXT 2**

### **Part I**

*Read the text and translate it paying attention to the definition of the term “computer graphics”.*

## **COMPUTER GRAPHICS**

Computer graphics means the use of computers to produce pictorial images. The images produced can be printed documents or animated motion pictures, but the term computer graphics refers particularly to images displayed on a monitor. Monitor can display graphic as well as alphanumeric data. A computer-graphics system basically

consists of a computer to store and manipulate images, a monitor, various input and output devices, and a graphics software package-i.e., a program that enables a computer to process graphic images by means of mathematical language.

A computer displays images on the phosphor-coated surface of a graphics display screen by means of an electron beam that sweeps the screen many times each second. Those portions of the screen energized by the beam emit light, and changes in the intensity of the beam determine their brightness and hue. The brightness of the resulting image fades quickly, however, and must be continuously “refreshed” by the beam, typically 85 times per second.

## **Part II**

Graphics programs enable a user to draw, color, shade, and manipulate an image on a display screen with the use of a mouse, a pressure-sensitive tablet, or a light pen. Preexisting images on paper can be scanned into the computer through the use of scanners, digitizers, pattern-recognition devices, or digital cameras. Frames of images on videotape also can be entered into a computer. Various output devices have been developed as well; special programs send digital data from the computer’s memory to an imagesetter or film recorder, which records the image sequence on video film. The computer can also generate hard copy by means of plotters and laser or dot-matrix printers.

Pictures are stored and processed in a computer’s memory by either of two methods: raster graphics and vector graphics. Raster-type graphics maintain an image as a matrix of independently controlled dots, while vector graphics maintain it as a collection of points, lines, and arcs. Raster graphics are now the dominant computer graphics technology.

Raster graphics create uniform colored areas and distinct patterns and allow precise manipulation. Raster graphics emerged in the early 1970s and had largely displaced vector systems by the ‘90s.

Vector-graphics technology which was developed in the mid-1960s and had been widely used until it was supplanted by raster graphics. Its application is now largely restricted to highly linear work in computer-aided design and architectural drafting, and even this is performed on raster-type screen with the vector-type screens with the vectors converted into dots.

Computer graphics has found widespread use in printing, product design and manufacturing, scientific research, and entertainment since 1960s.

**Exercise 1. *Name the components of a computer-graphics system.***

### **TEXT 3**

***Scan the text, pay attention to the words “however”, “suppose”, “generally” and their place in the sentence.***

## CRYPTOGRAPHY

Cryptography is no longer a military thing that should not be messed with. It is time to demystify cryptography and make full use of the advantages it provides for the modern society. In the following text basic terminology and the main methods of cryptography are presented.

Suppose that someone wants to send a message to a receiver and wants to be sure that no-one can read the message. However, there is a possibility that someone else opens the letter or hears the electronic communication. In cryptographic terminology, the message is called plaintext or cleartext. Encoding the contents of the message in such a way that hides its contents from outsiders is called encryption. The encrypted message is called the ciphertext. The process of retrieving the plaintext from the ciphertext is called decryption. Encryption and decryption usually make use of a key, and the coding method is such that decryption can be performed only by knowing the proper key.

Cryptography is the art or science of keeping messages secret. Cryptanalysis is the art of breaking ciphers, i.e. retrieving the plaintext without knowing the proper key. People who do cryptography are cryptographers, and practitioners of cryptanalysis are cryptanalysts.

Generally, cryptography deals with all aspects of secure messaging: authentication, digital signatures, electronic money and other applications. Cryptology is the branch of mathematics that studies the mathematical foundations of cryptographic methods.

**Exercise 1.** *Make up your own sentences with the words “however”, “suppose”, “generally”.*

**Exercise 2.** *Choose the words with the root “crypt” and translate them.*

## Unit VI

### ***Words and word combinations to be remembered.***

erase – стирать, убирать

corrupt – разлагать

payload – загрузка

benign virus – неопасный вирус, мягкий по действию

malignant virus – злокачественный вирус

to inflict – наносить удар

malicious virus – преднамеренно злобный

intentional – намеренный

viral code – вирусный код

to infect files – заразить файл

template – шаблон

### ***Exercise 1. Train the pronunciation and translate the international words.***

Virus, version, to affect, to implant, specific, symptom, destructive.

### ***Exercise 2. Word-building.***

a) Change the following verbs into nouns by means of suffixes.

*Model: to infect – infection*

to mutate, to affect, to implant, to destruct, to corrupt, to compress.

b) Define parts of speech by their suffixes. Translate the words into Russian.

Virus, viral; describe, description, descriptive; system, systematic, systematically; to alter, alternation, alternative; to execute, execution, executive, executable; species, specify, specific, specification; malice, malicious, maliciously.

### ***Exercise 3. Give the Russian equivalents of the following nouns with the suffixes – man, -ian:***

Policeman, watchman, sportsman, chairman, technician, academician, Bulgarian, Asian.

### ***Exercise 4. Complete the following sentences:***

1. A technician is a specialist in ... .
2. A parliamentarian is a member of ... .
3. An academician is a member of ... .
4. We call people who live in Asia ... .
5. We call people who live in Europe ... .

### ***Exercise 5. Give the Russian equivalents of the following adjectives with the suffix (-able).***

Changeable, breakable, controllable, readable, portable, executable.

### ***Exercise 6. Answer the questions:***

1. What breakable things are there on your table?
2. When is the weather most changeable?
3. Have you got a portable computer?
4. Is your handwriting readable?
5. What day off is desirable for you?

**Exercise 7. Paraphrase the word combinations, using adjectives with the suffix –able.**

*Model: that can be changed – changeable.*

That can be pronounced, that can be understood, that can be broken, that can be controlled, that can be washed, that can be questioned, that can be executed.

**Exercise 8. Match the synonyms.**

1	2
1. to alter	a) sign
2. segment	b) dangerous
3. to corrupt	c) strong
4. symptom	d) to change
5. malicious	e) task
6. currently	f) portion
7. powerful	g) to destruct
	h) to make use of
	i) nowadays

**Exercise 9. Remember the explanations of the terms. Translate the sentences into Russian.**

1. A virus is a segment of program code that implants itself to one of your executable files and spreads systematically from one file to another.
2. A benign virus is one that designed to do no real damage to your computer.
3. A malignant virus is one that attempts to inflict malicious damage to your computer.
4. The boot sector is the set of instructions your computer uses when it starts up.
5. Boot sector viruses attach themselves to floppy discs and then copy themselves into boot sector of your hard drive.

**TEXT 1**

**Comprehensive reading**

**COMPUTER VIRUSES**

A virus is a piece of software designed and written adversely affect your computer by altering the way it works without your knowledge or permission. In more technical terms, a virus is a segment of program code that implants itself to one of

your executable files and spreads systematically from one file to another. Computer viruses must be written and have a specific purpose. Usually a virus has two distinct functions: spreads itself from one file to another without your input or knowledge and implements the symptom or damage planned by the perpetrator\*. This could include erasing a disk, corrupting your programs or just creating havoc\*\* on your computer. Technically, this is known as the virus payload, which can be benign or malignant.

A benign virus is one that is designed to do no real damage to your computer. A malignant virus is one that attempts to inflict malicious damage to your computer, although the damage may not be intentional. There are a significant number of viruses that cause damage due to poor programming and outright bugs in the viral code. Some of the more malignant viruses will erase your entire hard disk, or delete files. Many of the currently known Macintosh viruses are not designed to do any damage. However, because of bugs (programming errors) within the virus, an infected system may behave erratically.

Computer viruses don't infect files on write-protected disks and don't infect documents, except in the case of Word macro viruses, which infect only documents and templates written in Word 6.0 or higher. They don't infect compressed files either. However, applications within a compressed file could have been infected before they were compressed. Viruses also don't infect computer hardware, such as monitors or computer chips; they only infect software. Finally, viruses don't necessarily let you know that they are there - even after they do something destructive.

Nowadays the number of viruses is about 55000. It increases constantly. New unknown types of viruses appear. To classify them becomes more and more difficult. In common they can be divided by three basic signs: a place of situating, used operation system and work algorithms.

There are three groups of file infectors:

Viruses of the **first group** are called overwriting viruses because they overwrite their code into infected file erasing contents. But these viruses are primitive and they can be found very quickly.

**The second group** is called parasitic or cavity viruses. Infected file is capable of work fully or partly but contents of last one are changed. Viruses can copy itself into begin, middle or end of a file.

**The third group** is called companion viruses. They don't change files. They make double of infected file so when infected file is being started a double file becomes managing, it means virus.

### *Notes:*

\*perpetrator - преступник

\*\*havoc - опустошение

## COMPREHENSION CHECK

**Exercise 1. Agree or disagree with the following statements.**

1. A computer virus is designed for altering the way your computer works without your knowledge.
2. A computer virus is a segment of program code that implants itself to one of your executable files.
3. Computer viruses don't have a specific purpose.
4. Viruses infect computer hardware, such as monitors or computer chips.
5. Nowadays number of viruses is about 55000.
6. The number of computer viruses remains constant.
7. To classify computer viruses becomes more and more difficult.
8. New types of unknown viruses appear.
9. Viruses can be divided by three basic signs: a place of situating, used operation system and work algorithms.
10. Multi-partite viruses infect files and boot sectors.

**Exercise 2. Join the following parts, consulting the text.**

<ol style="list-style-type: none"> <li>1. Usually a virus has two distinct functions</li> <li>2. Virus can include</li> <li>3. There are a significant number of viruses</li> <li>4. Computer viruses don't infect files</li> <li>5. A malignant virus is one that</li> </ol>	<ol style="list-style-type: none"> <li>a) erasing a disk, corrupting your programs or creating havoc on your computer.</li> <li>b) it spreads itself from one file to another without your input or knowledge.</li> <li>c) on write-protected discs and don't infect documents.</li> <li>d) that cause damage due to poor programming and outright bugs in the viral code.</li> <li>e) attempts to inflict malicious damage to your computer.</li> </ol>
---	--

**Exercise 3. Answer the questions.**

1. How many groups of file infectors are viruses divided into?
2. What signs are these groups classified by?
3. What is the third group called?
4. What do viruses of this group make?

**Exercise 4. Give the term to the following definitions. Choose the terms from given in brackets (a malignant virus, a virus, a benign virus).**

1. ... a piece of software designed and written to adversely affect your computer.
2. ... is one that attempts to inflict malicious damage to your computer.
3. ... is one that is designed to do no real damage to your computer.

## LANGUAGE ACTIVITY

### **Exercise 1. *Insert prepositions where necessary (of, in, into, by, during).***

Firstly viruses can be divided ... resident and nonresident. Resident virus having come ... operation memory of computer doesn't infect ... memory. They are capable ... copying when they are started only. We can call any macro virus resident. They present in memory during the work of the infected application.

Viruses can be visible and invisible. To be invisible means that users and antivirus programs can't notice changes ... infected file done ... virus. One ... first invisible file infectors was FRODO and boot infector – BRAIN.

### **Exercise 2. *Summarize knowledge on the Infinitive. Translate the sentences into Russian. Point out the Infinitives.***

1. To transform the Net from academic backwaters into the global Web was the aim Berners-Lee decided to achieve.
2. The text to be translated with a computer shouldn't be too long.
3. His knowledge of the subject was deep enough to encourage the colleagues for future cooperation.
4. To use the Internet to conduct a real business has become every businessperson's need.
5. The aim was to have all the nets integrated in one system.
6. To start business a company needs a highly sophisticated computational equipment.
7. To write computer programs, to work out data to be processed is a very time-consuming job.
8. The problem is too complicated to be solved on the spot.

### **Exercise 3. *Translate the sentences into Russian. Point out the For + Infinitive Constructions.***

1. Everything has been done for Internet shopping to be of great interest to everyone involved in commerce.
2. It is already possible to talk to a computer for a speech to be accepted directly (voice input).
3. For the results to be a success much work is to be done.
4. Almost every family was eager for a PC to be bought and applied to home holding.
5. For the data on every happening to be the freshest the information on the Web is being constantly updated.

### **Exercise 4. *Translate the sentences into Russian. Point out the Subjective Infinitive Constructions.***

1. The first thousand of the Net enthusiasts proved to be mainly academic and computer professionals.
2. Even the more sophisticated computational systems are unlikely to substitute the human brain.
3. CERN and MIT are known to be the first to turn towards Web development.



4. The Microsoft Corporation is considered to have become the world's biggest PC software provider.
5. The invention of microchips and new operating systems was expected to enable smaller and cheaper computers to perform difficult tasks faster.
6. The Web is stated to have created a standard that everybody could - and did - follow.

**Exercise 5. Translate the sentences into Russian. Point out the Objective Infinitive Constructions.**

1. Lady Byron considered computers to be basically stupid although they could seem clever.
2. We know the first computers to have represented a mass of vacuum tubes, transistors and integrated circuits.
3. Teachers expect the Centre of Education to provide them with information on programs for keeping students competitive in science and technology.
4. Businesspeople would like selling to be done anywhere via Web and other Internet resources.
5. We believe Hollerith to be the second giant after Babbage due to his «tabulating machine» to have completed the results of the 1890 US Census.
6. People involved in business know several cases of on-line fraud and computer-based espionage to have been committed.
7. Engineers know the speed of light to be the limiting speed on computers.
8. Do you know the Queen of Great Britain to become the first Head of State to use the global computer network.

## SUPPLEMENTARY TEXTS

### TEXT 1

*Read the text and answer the question of the title.*

#### **WHAT IS A TROJAN HORSE AND WHAT THREAT DOES IT POSE?**

Since "Trojan Horses" (or Backdoors) have been in the news just recently, the term probably sounds familiar to you. But perhaps you're not quite sure what a Trojan Horse is and what damage it is capable of doing to your system. Trojan Horses, of which there are now more than one thousand in circulation (including modifications and variants), are a relatively new and probably the most dangerous strain of viruses that have appeared in recent times. They also threaten to overwhelm systems that only run anti-virus applications and firewalls as a means of combating the threat. Today's Trojans as they are commonly referred to as, have now attained such a degree of sophistication that they pose a real threat to any user who hasn't taken adequate precautions to protect their data.

The name "Trojan Horse" derives itself from a page in Greek history when the Greeks had lain siege to the fortified city of Troy for over ten years. Their spy, a Greek called Sinon offered the Trojans a gift in the form of a wooden horse and convinced them that by accepting it, they would become invincible. The horse though was hollow and was occupied by a contingent of Greek soldiers. When they emerged in the dead of night and opened the city gates, the Greeks swarmed in, slaughtered its citizens and subsequently pillaged, burned and laid waste to the city. In the IT environment, the Trojan Horse acts as a means of entering the victim's computer undetected and then allowing a remote user unrestricted access to any data stored on the user's hard disk drive whenever he or she goes online. In this way, the user gets burned and like the unfortunate citizens of Troy, may only discover that fact when it is too late.

These types of viruses were originally designed as a means of self expression by gifted programmers and did little more than to cause the system to lock up, behave abnormally in a specific way or perhaps cause loss of data on the user's machine.

## TEXT 2

### INCREASE YOUR KNOWLEDGE OF COMPUTER VIRUSES

What is a virus?

In 1983, researcher Fred Cohen defined a computer virus as "a program that can "infect" other programs by modifying them to include a version of itself." This means that viruses copy themselves, usually by encryption\* or by mutating\*\* slightly each time they copy. There are several types of viruses, but the ones that are the most dangerous are designed to corrupt your computer or software programs. Viruses can range from an irritating\*\*\* message flashing on your computer screen to eliminating data on your hard drive. Viruses often use your computer's internal clock as a trigger. Some of the most popular dates used are Friday the 13th and famous birthdays. It is important to remember that viruses are dangerous only if you execute (start) an infected program. There are three main kinds of viruses. Each kind is based on the way the virus spreads.

1. **Boot Sector Viruses** - These viruses attach themselves to floppy disks and then copy themselves into the boot sector of your hard drive. (The boot sector is the set of instructions your computer uses when it starts up.) When you start your computer (or reboot it; your hard drive gets infected. You can get boot sector viruses only from an infected floppy disk. You cannot get one from sharing files or executing programs. This type of virus is becoming less common because today's computers do not require a boot disk to start, but they can still be found on disks that contain other types of files.

One of the most common boot sector viruses is called "Monkey", also known as "Stoned".

2. **Program Viruses** - These viruses (also known as traditional file viruses) attach themselves to programs' executable files. They can infect any file that your computer

runs when it launches a program. When you start a program that contains a virus, the virus usually loads into your computer's memory. When the virus is in your computer's memory, it can infect any other program that is started. Program viruses that have circulated recently are "SKA" and "Loveletter."

3. **Macro Viruses** - These viruses attach themselves to templates that are used to create documents or spreadsheets. Once a template is infected, every document or spreadsheet you open using that program also will become infected. Macro viruses are widespread because they infect commonly used office applications and spread between PCs and Macintoshes. Macro viruses include "Concept", "Melissa", and "Have a Nice Day".

**Notes:**

\*encryption - кодирование

\*\*mutating - мутация

\*\*\*irritating – раздражающий

**Exercise 1. Say what you have learned about:**

- a) boot sector viruses
- b) program viruses
- c) macro viruses

**Exercise 2. Compare this subdivision with the subdivision of viruses in the main text.**

**TEXT 3**

**Read the text and answer the questions asked in the text.**

**YOU CANNOT GET VIRUS FROM**

You cannot get a virus from:

- opening an e-mail message. However, you can get a virus from opening a file attached to an e-mail message.
- reading a Web page. You can get a virus only by downloading *and* running a program, usually your Web browser will warn you when you begin to download a program from the Web.
- downloading a file. Downloading a file will not infect your computer with a virus. However, installing or opening an infected document or a software program will infect your computer.

If you think you might have a virus, ask yourself these questions:

1. Are my software programs taking longer to load than they used to?
2. Are my software programs crashing for no apparent reason?
3. Is my computer checking my hard drive often?

4. Are my files disappearing for no apparent reason?
5. Am I experiencing frequent file corruption?
6. Are items that used to work no longer working (providing you haven't made any changes to your system)?
7. Have you recently used any floppy disks that were in someone else's computer?
8. Have you recently downloaded and executed any computer programs or games from the Internet?
9. Have you received e-mail from an unfamiliar source?
10. Have you received e-mail with an attachment?

## **TEXT 4**

### **Part I**

#### **ANTIVIRUS SOFTWARE**

Many choices exist for antivirus software, so determining what will work for you is important. Consider these points when looking at antivirus software:

Does the company have NCSA/ICSA certification? The newest version of a company's antivirus software should be certified. To receive certification the software must detect 100 percent of the viruses that are in the "wild" and at least 90 percent of all other viruses.

- Check with virus testing centers. You can find such centers by searching the Internet.
- Make sure that you are comfortable with the program you choose because you will want to access and update the program frequently. Ask at your local computer store for antivirus software that meets the above standards.

**Exercise 1.** *What point is the most useful for choosing antivirus program. Do you use antivirus programs?*

### **Part II**

#### **PREVENTING A VIRUS**

- Purchase and install antivirus software, and update it frequently. Virus software can be obtained from a variety of sources.
- Most antivirus packages have a component that loads at computer startup and monitors files as you use them.
- Scan every file you receive: files from friends, programs from the Internet, e-mail attachments, and even shrink-wrapped software.

Do not configure your e-mail program to launch your word processing program automatically when it receives an attachment.

- Scan every file you download from the Web before you install or read it.

- Be very careful about putting floppy disks from unknown sources into your computer. Be especially careful if the disk has been shared by several people. The more computers that have used the disk the more likely that it could contain a virus.
- Back up all your data files on a regular basis.
- Make sure that you have the original disks or CD-ROMs for all your software.

**Exercise 1. *Read the text and say what form the text is written in:***

- a) a story
- b) recommendations

**Exercise 2. *What recommendation would you follow?***

***Topics for discussion.***

- 1. Different terms used for “virus”.***
- 2. The problem of computer viruses.***
- 3. Means of avoiding catching a virus.***

## Chapter IV

### Check yourself!

#### Tests

#### Chapter I

#### I. Find Russian equivalents to the following words, terms and expressions.

*Example:*

a) interact	1. частица	Answer
b) spread	2. влияние	a 4
c) fusion	3. распространяться	b 3
d) particle	4. взаимодействовать	c 6
	5. количество	d 1
	6. слияние	

---

1.

a) acceleration	1. расщепление
b) at rest	2. снижать
c) internal	3. материя
d) matter	4. в состоянии
e) nuclear	покоя
f) fission	5. ускорение
g) shape	6. ядерный
h) exchange	7. основной
	8. внутренний
	9. тепло
	10. относительность
	11. обмен
	12. форма

2.

a) civil engineering	1. исследование
b) divide	2. движение
c) equipment	3. гражданское строительство
d) device	4. разделять
e) motion	5. оборудование
f) store	6. последовательность
g) pure sciences	7. движение
h) research	8. хранить в памяти
	9. сложность
	10. прибор
	11. диапазон
	12. точные науки

## II. Find the synonyms

Example:

- |           |   |               |
|-----------|---|---------------|
| 1. sample | a) example<br>b) experience<br>c) seat<br>d) book<br>e) force | Answer<br>1-a |
|-----------|---|---------------|
- 

- |                |  |
|----------------|--|
| 3. to increase | a) to convert<br>b) to inform<br>c) to enlarge<br>d) to enrich |
|----------------|--|

- |             |   |
|-------------|---|
| 4. to begin | a) to move<br>b) to go on<br>c) to start<br>d) to leave |
|-------------|---|

- |           |  |
|-----------|--|
| 5. action | a) deed<br>b) basic<br>c) fusion<br>d) shape |
|-----------|--|

- |          |  |
|----------|--|
| 6. house | a) building<br>b) structure<br>c) fortification<br>d) elevator |
|----------|--|

- |            |  |
|------------|--|
| 7. combine | a) to divide<br>b) to react<br>c) to complete<br>d) to unite |
|------------|--|

## III. Fill in the gaps with necessary words.

Example:

Electricity and magnetism are ... .

- a) the basic subdivisions of physics
- b) the basic subdivisions of maths
- c) the basic subdivisions of optics

Answer: 1-a

---

- |                               |                     |
|-------------------------------|---------------------|
| 8. Mass is ... of the object. | a) internal quality |
|-------------------------------|---------------------|

- b) external quality
- c) negligible quality

9. ... studies controlled thermonuclear fusion and the exploration of space.

- a) Optics
- b) Plasma physics
- c) Mechanics

10. An electric ... can be alternative or direct.

- a) charge
- b) current
- c) power

11. Physics deals with ... .

- a) fiber optics
- b) matter and energy and how they interact
- c) chemical reactions

12. The problems of ... are studied in political economy.

- a) demand and supply
- b) quality and quantity
- c) increasing and decreasing

13. ... influences the orbits of planets around the Sun.

- a) Gravitation
- b) Pressure
- c) Power supply

#### **IV. Find the suitable completing of the sentences.**

*Example:*

Physics ... with matter and energy and how they interact.

- a) dealt
- b) deals
- c) deal

Answer: 1-b

---

14. Energy forms ... light, heat, sound, magnetism and electricity.

- a) is including
- b) include
- c) includes

15. Atomic physics made it possible to ... to construct his Periodic Table of elements.

- a) Einstein
- b) Pavlov
- c) Mendeleyev



16. I am sure he will consider the problem ... .
- a) by him
  - b) himself
  - c) yourself
17. Any total branch of energy ... changed in amount.
- a) could be
  - b) can not be
  - c) is to be
18. Physics ... to be the most basic of the natural sciences.
- a) are considered
  - b) were considered
  - c) is considered
19. All waves ... wavelength and frequency.
- a) have
  - b) has
  - c) has had
20. We must ... all necessary conditions for the experiment.
- a) to provide
  - b) provided
  - c) provide

## Chapter II

### I. Find Russian equivalents to the following words, terms and expressions.

Example:

a) procedure	1. изменение	Answer
b) force	2. закон	a 6
c) law	3. вселенная	b 4
d) alteration	4. сила	c 2
	5. сжать	d 1
	6. процедура	

---

— — —

1.

a) application	1. подход
b) current	2. тело
c) approach	3. частый
d) ray	4. полет
e) invisible	5. применение
f) influence	6. исследование
g) frequent	7. луч
h) investigation	8. проникать
	9. влияние
	10. невидимый
	11. состояние покоя
	12. ток

2.

a) glow	1. волна
b) contribution	2. огромный
c) property	3. светиться
d) penetrate	4. вклад
e) capacity	5. соотносить
f) correlate	6. ряд
g) wave	7. проникать
h) discovery	8. способность
	9. внимание
	10. открытие
	11. предел
	12. свойство

3.

- |               |                          |
|---------------|--------------------------|
| a) create     | 1. уравнение             |
| b) vehicle    | 2. транспортное средство |
| c) equation   | 3. приземляться          |
| d) combustion | 4. случайный             |
| e) surface    | 5. разработка            |
| f) chamber    | 6. поверхность           |
| g) target     | 7. камера                |
| h) random     | 8. цель                  |
|               | 9. космический корабль   |
|               | 10. сгорание             |
|               | 11. создавать            |
|               | 12. вклад                |

**II. Find suitable English equivalents to the following terms and expressions.**

*Example:*

- |              |                 |        |
|--------------|-----------------|--------|
| 1. ускорение | a) accompany    | Answer |
|              | b) acceleration | 1 b    |
|              | c) acquaintance |        |
|              | d) action       |        |
- 

- |                |                |
|----------------|----------------|
| 4. определение | a) definition  |
|                | b) approach    |
|                | c) motion      |
|                | d) observation |

- |            |                |
|------------|----------------|
| 5. частный | a) seldom      |
|            | b) frequent    |
|            | c) significant |
|            | d) particular  |

- |           |                |
|-----------|----------------|
| 6. ценный | a) possible    |
|           | b) complete    |
|           | c) rectilinear |
|           | d) valuable    |

- |               |                |
|---------------|----------------|
| 7. применение | a) adoption    |
|               | b) equipment   |
|               | c) application |
|               | d) airtight    |

- |                 |                 |
|-----------------|-----------------|
| 8. качественный | a) quantitative |
|                 | b) qualitative  |
|                 | c) quantum      |
|                 | d) quarrelsome  |

9. СТОЛКНОВЕНИЕ            a) coincidence  
                                      b) content  
                                      c) clearance  
                                      d) collision

10. расширение            a) exposition  
                                      b) export  
                                      c) extension  
                                      d) explosion

### III. Match the antonyms.

*Example:*

1. special	a) stop	Answer
2. continue	b) unknown	1-e
	c) attract	2-a
	d) pull	
	e) ordinary	

---

11.

1. particular	a) unite
2. unknown	b) decrease
3. artificial	c) general
4. automatic	d) manned
5. increase	e) famous
6. separate	f) natural
	g) fuel
	h) celestial

### IV. False or True?

*Example:*

1. Isaac Newton an English physicist and mathematician was born in a rich family.  
1-F

---

12. Book II presented Newton's new scientific philosophy.

13. Newton presented his methodology as a set of five rules for scientific reasoning.

14. Every object has a gravitational pull, which is like magnetism.

15. The first law introduces the idea of inertia and is often called the law of inertia.

16. X-ray examination has found application in various kinds of industrial processes.
17. X-rays have no penetrating power because of their short wavelength and high frequency.
18. The anode or negative electrode consists of a block of metal.
19. Proving Mendeleev's predictions, in 1875 the element gallium was discovered.
20. Konstantin Tsiolkovsky was born in 1857 in a family of a Polish forester who had emigrated to Russia.

## Chapter III

I.

*Example:*

1. addition	a) каркас	Answer:
2. rack	b) сложение	1-b
3. access	c) доступ	2-a
	d) вклад	3-с
	e) приложение	

---

1.

a. remote	1. вычитание
b. trial	2. использование
c. pattern	3. количество
d. subtraction	4. достижение
e. valid	5. образец
f. tool	6. отдаленный
g. amount	7. клетка
h. sequence	8. инструмент
	9. метод сборки
	10. последовательность
	11. действительный
	12. точный
	13. проба

2.

a. request	1. гнездо памяти
b. memory socket	2. изгиб
c. reduction	3. быть ответственным за
d. hardware	4. схема
e. defense	5. аппаратное обеспечение
f. screen	6. статья
g. to be responsible	7. экран
h. system busses	8. вводить
	9. системные шины
	10. сокращение
	11. запрос
	12. краткий
	13. оборона

3.

a. update	1. покупатель
b. software	2. шаблон
c. customer	3. подложка

- |                 |                             |
|-----------------|-----------------------------|
| d. template     | 4. модернизировать          |
| e. software     | 5. стирать                  |
| f. distribute   | 6. загрузка                 |
| g. render       | 7. распространять           |
| h. installation | 8. предоставлять            |
|                 | 9. удар                     |
|                 | 10. установка               |
|                 | 11. вирусный код            |
|                 | 12. влиять                  |
|                 | 13. программное обеспечение |

**II. Find suitable Russian equivalents to the following words and collocations.**

*Example:* hardware components

- |                           |     |
|---------------------------|-----|
| a) компоненты программы   | 1-с |
| b) части системного блока |     |
| c) аппаратные компоненты  |     |

4. power supply

- a) питание на вводе
- b) источник питания
- c) питание на выходе

5. floppy disc

- a) жесткий диск
- b) гибкий диск
- c) заполненный диск

6. keyboard

- a) клавиатура
- b) экран
- c) электронное устройство

7. defensive industry

- a) гражданское строительство
- b) военная промышленность
- c) оборонная промышленность

8. feedback

- a) соответствие
- b) замкнутая цепь
- c) обратная связь

9. extension

- a) расширение
- b) увеличение

с) разветвление

10. data processing tools

- a) инструменты для обработки данных
- b) инструменты для распечатки данных
- c) инструменты для хранения данных

### III. Match the synonyms.

*Example:*

1. future	a. capability	Answer:
2. ability	b. multiply	1-e
3. start	c. begin	2-a
	d. calculate	3-c
	e. characteristic	

---

11.

1. valuable	a. demand
2. permit	b. investigator
3. remote	c. keep
4. display	d. important
5. require	e. submit
6. explorer	f. show
7. contain	g. distant
	h. dick on
	i. employ
	j. allow

### IV. What is each component responsible for?

*Example:*

A floppy dick drive is used ... .	1-a
a) for storing information into a floppy disc	
b) for processing information	
c) for recording information	

---

12. Power supply is responsible for ... .

- a) converting graphics and text into the monitor
- b) storing data, instruction and information
- c) converting standard household power into a form that computer can use

13. Monitor is a device responsible for ... .

- a) conveying information to the user
- b) loading data and instructions into a computer
- c) using special keys for instructions



14. A mouse is responsible for ... .
- a) displaying texts
  - b) control of the movement of a symbol on the screen
  - c) long-term storage of data

**V. Join the following parts according to the read texts.**

15. 1. Virus can include ... .
2. Computer viruses don't infect files... .
3. A history of computers starts about ... .
4. Space technology would be almost unthinkable ....
5. Memory is a temporary storage place ....
6. Internet is the largest ....
- a. 300 B.C.
  - b. erasing a disk corrupting your program, etc.
  - c. communication network in the world.
  - d. on written-protected disks.
  - e. articles are absolutely exclusive.
  - f. without the power of computer.
  - g. adherent to traditional forms of art.
  - h. for data, instructions, and information.

# Dictionary

## A

- accept** *v* принимать  
**accident** *n* авария  
**accompany** *v* сопровождать  
**accurate** *a* точный  
**actline** *v* выделять, вычерчивать  
**advance** *v* выдвигать (*идею, теорию*)  
**advanced** *a* передовой  
**advancement** *n* движение вперед  
**advantage** *n* преимущество  
**advertisement** *n* объявление, реклама  
**advice** *n* совет  
**advise** *v* советовать  
**aeronautics** *n* воздухоплавание  
**affect** *v* влиять на что-л.  
**after** *prp, cj, adv* после  
**again** *adv* снова  
**against** *prp* против  
**age** *n* возраст  
**ago** *adv* тому назад  
**agree** *v* соглашаться  
**ahead of time** заранее  
**aid** *v* помогать; *n* помощь  
**aim** *v* направлять, нацеливать(ся); *n* цель; **to be aimed at** предназначаться для чего-л.  
**air** *n* воздух, атмосфера; ~ **breather** воздушно-реактивный двигатель; ~ **drag** аэродинамическое сопротивление  
**aircraft** = **airplane** *n* самолет, аэроплан; ~ **construction (design)** самолетостроение  
**airship** *n* воздушный корабль  
**alike** *adj* похожий; одинаковый; *adv* подобным образом; одинаково  
**all** *adj, pron* весь, все, вся, всё; ~ **kinds of** = ~ **sorts of** самые разнообразные; ~ **over the world** во всем мире  
**allow** *v* позволять, разрешать  
**alloy** *n* сплав  
**almost** *adv* почти  
**alone** *adv* один; только  
**already** *adv* уже  
**also** *adv* тоже  
**alternative** *adj* другой (*при выборе*); разный; *n* выбор  
**alternation** *n* изменение  
**although** *cj* хотя  
**aluminium** *n* алюминий  
**a.m.** = **ante meridiem** время от 12 ночи до 12 дня (полудни)  
**amazing** *a* впечатляющий  
**among** *prp* среди  
**amount** *n* количество  
**amper** *n* ампер  
**analogue** *n* аналог  
**analyse** *v* рассматривать  
**analysis** *n* анализ

**anniversary** *n* годовщина  
**announce** *v* объявлять  
**announcement** *n* объявление  
**another** *a* другой  
**anticipate** *v* предвидеть  
**apart** *adv* на расстоянии; отдельно  
**apparatus** *n* аппарат, прибор, устройство  
**appear** *v* появляться, казаться; ~ **useful** оказаться полезным  
**appearance** *n* появление, наружность, внешний вид  
**appliance** *n* устройство, приспособление  
**application** *n* применение; заявление  
**applied** *a* прикладной  
**apply** *v* применять, использовать  
**appoint** *v* назначать (*на должность*)  
**appreciate** *v* оценивать; **to be highly ~ed** получить высокую оценку  
**approach** *v* подходить, приближать(ся) (*к*); *n* приближение  
**appropriate** *a* соответствующий, подходящий  
**approve** *v* одобрять; **to be ~d** получить одобрение  
**approximate** *a* приблизительный; ~ **calculations** приближенные вычисления  
**architect** *n* архитектор  
**arise (arose, arisen)** *v* возникать  
**arm** *n* рука  
**army** *n* армия  
**around** *adv, prp* вокруг  
**arrange** *v* устанавливать, устраивать, располагать  
**arrangement** *n* устройство, расположение  
**arrive (at, in)** *v* прибывать, приезжать; ~ **at the conclusion** прийти к выводу  
**artificial** *a* искусственный  
**as** *conj* так как, как, по мере того как; в то время как, когда, в качестве (**чего-л., кого-л.**); ~ **a consequence** в результате; как результат; ~ **early** ~ еще (*давно, о времени*); ~ **far back** ~ еще (*давно по времени*); **as follows** следующим образом; ~ **if** как если бы; ~ **long** ~ пока (*по времени*); ~ **much** ~ **possible** как можно больше; ~ **a result** в результате; ~ **a rule** как правило; ~ **soon** ~ как только; ~ **soon** ~ **possible** как можно скорее; ~ **though** как если бы; ~ **time went on** по мере того как шло время; с течением времени; ~ **to** что касается; ~ **well** также, а также: **well** ~ так же как.

**ask** *v* спрашивать; просить; ~ **for (smth.)** просить что-л.  
**aspect** *n* вид, особенность; аспект  
**assemble** *v* собирать  
**assist** *v* помогать  
**associate** *a*: **to be ~ with** быть связанным с чем-л.  
**assume** *v* допускать, полагать, принимать  
**astronomer** *n* астроном  
**at** *prp* у, около, во, на; ~ **last** наконец; ~ **least** по крайней (меньшей) мере; ~ **one time or another** в то или иное время  
**atmosphere** *n* атмосфера  
**atom** *n* атом  
**attach** *v* прикреплять, присоединять  
**attain** *v* достигать; получать  
**attempt** *n* попытка  
**attend** *v* посещать

**attention** *n* внимание  
**attitude** *n* отношение (к чему-л.)  
**attract** *v* притягивать; ~ **attention** привлекать внимание  
**author** *n* автор  
**automatic** *a* автоматический  
**available** *a* существующий, наличный; доступный  
**average** *a* средний; приблизительный  
**aviation** *n* авиация; *a* авиационный  
**avoid** *v* избегать  
**award** *n* награда; *v* награждать; **to be ~ed** получить награду  
**away (from)** *adv* далеко от; в стороне от; в сторону от  
**axis** *n* (*pl axes*) ось (*геометр.*)

## В

**back** *adv* обратно, назад; *v* поддерживать  
**base** *n* основание; *v* основывать; **to be ~d (on)** основываться на чем-л.  
**basis** *n* основа, база  
**beam** *n* луч, пучок лучей  
**because** *conj* так как, потому что; ~ **of** *prp* вследствие, из-за  
**become (became, become)** *v* становиться  
**before** *adv* впереди; раньше; *prp* перед; до; *conj* прежде чем  
**begin (began, begun)** *v* начинаться; **to ~ with** прежде всего, во-первых, сначала  
**behaviour** *n* поведение  
**behind** *adv* сзади; после; *prp* за, сзади  
**believe** *v* верить, полагать, считать  
**belong** *v* принадлежать, относиться к чему-л.  
**below** *adv* ниже, внизу; *prp* под  
**bend (bent, bent)** *v* гнуть, изгибать(ся)  
**benefit** *n* польза, выгода, благо  
**besides** *adv* помимо, кроме; *prp* кроме  
**beyond** *prp*. За пределами, вне  
**binary** *a* двойной, двоичный; ~ **alloy** двойной (бинарный) сплав; ~ **digit** двоичное число  
**bind (bound, bound)** *v* прикреплять, присоединять, привязывать  
**bit** *n* кусочек, часть  
**blank** *a* пустой, свободный; *n* пропуск; ~ **space** пустое (незаполненное) место  
**blow (blew, blown)** *v* дуть; *n* удар  
**board** *n* борт (*корабля*); совет, правление; плата; **mother~** материнская плата  
**body** *n* тело; корпус; институт (учреждение)  
**bomb** *n* бомба; *v* бомбардировать  
**bone** *n* кость  
**border** *n* граница; ~ **line** граница, пограничная зона  
**born: to be ~** родиться  
**botany** *n* ботаника  
**bother** *v* беспокоить, причинять беспокойство  
**boundless** *a* безграничный  
**brain** *n* мозг  
**branch** *n* ветвь, отрасль; *v*: ~ **out** ответвляться; развиваться (*в другом направлении*)  
**break (broke, broken)** *v* ломать, разрушать; ~ **a machine** ломать машину; ~ **a rule** нарушать правило; ~ **out** разразиться (*о войне*)  
**bridge** *n* мост

**brief** *a* краткий  
**bright** *a* яркий, блестящий  
**bring (brought, brought)** *v* приносить, приводить, привозить; ~ **about** вызывать (*какое-л. явление*); ~ **in** вводить; ~ **to** доводить до  
**build (built, built)** *v* строить; ~ **up** построить, создать, составить  
**bulky** *a* громоздкий  
**burn (burnt или burned)** *v* гореть, сжигать; ~ **out**= ~ **up** сгорать; ~**t gas** отработанный газ  
**bus** *n* шина, канал  
**but** *adv* всего лишь; *prp* кроме; *cj* но, а, однако  
**button** *n* кнопка  
**buy (bought, bought)** *v* подкупать  
**by** *prp* около, у, возле; к (*определенному времени*), до (*определенного времени*); ~ **all means** любыми (всеми) способами; ~ **day (night)** днем (ночью); ~ **means of** при помощи, посредством чего-л.; ~ **now** к настоящему времени; ~ **the beginning of** к началу; ~ **the end of** к концу; ~ **the middle of** к середине; ~ **that time** к тому времени; ~ **the time** к тому времени, как; ~ **the way** между прочим, кстати

## С

**cable** *n* кабель  
**calcium** *n* кальций  
**calculate** *v* считать, подсчитывать; **calculating machine** счетная машина  
**calculation** *n* вычисление, подсчет, расчет  
**call** *v* называть; ~ **one's attention (to)** привлекать (обращать) чье-л. внимание на что-л.; ~ **for** требовать  
**candle** *n* свеча  
**capable** *a* способный; **to be** ~ быть в состоянии  
**capacity** *n* производительность; мощность; способность  
**capital** *n* столица  
**car** *n* автомобиль  
**carbon** *n* углерод  
**career** *n* карьера  
**card** *n* карточка  
**cardboard** *n* картон; *a* картонный  
**care** *n* забота; *v* заботиться; **to take** ~ заботиться  
**careful** *a* тщательный, внимательный, осторожный  
**carefully** *adv* тщательно  
**carry** *v* возить, носить, перевозить; ~ **out** проводить, выполнять работу (эксперимент)  
**case** *n* случай; судебное дело; **in the** ~ **of** в случае  
**cast (cast)** *v* бросать, отбрасывать (*тень*)  
**catch (caught)** *v* ловить, захватывать  
**cathode** *n* катод; *a* катодный; ~-**ray tube** катодно-лучевая лампа  
**cause** *n* дело, причина; *v* вызывать (*какое-л. явление*)  
**celestial** *a* небесный; ~ **body** небесное тело; ~ **mechanics** небесная механика  
**cell** *n* гальванический элемент; аккумулятор; клетка  
**centigrade** *a* стоградусный, разделенный на сто градусов  
**central** *a* центральный  
**centre** *n* центр  
**century** *n* столетие; век  
**certain** *a* некоторый; определенный; **to be** ~ быть уверенным; **in** ~ **respects** в некотором смысле (отношении)

**certainly** *adv* конечно  
**chain** *n* цепь  
**chair** *n* кафедра (*в учебном заведении*)  
**chamber** *n* камера  
**change** *n* изменение, перемена; *v* менять(ся)  
**character** *n* знак, буква, характер  
**charge** *n* заряд, топливная смесь (*в двигателе*)  
**check up** *v* проверять; *n* проверка  
**chemical** *a* химический; *n* химический элемент, химикалий; ~ **engineering** химическое машиностроение  
**chemist** *n* химик  
**chemistry** *n* химия  
**chief** *n* начальник; *a* главный  
**child** *n* ребенок  
**choice** *n* выбор  
**choose (chose, chosen)** *v* выбирать  
**chromium** *n* хром  
**circle** *n* круг, кольцо, кружок  
**circuit** *n* электрическая цепь  
**circumference** *n* окружность  
**civil** *a* гражданский; ~ **engineer** инженер-строитель; ~ **engineering** гражданское строительство  
**claim** *v* претендовать; заявлять  
**classify** *v* классифицировать  
**clear** *a* ясный, понятный  
**close** *v* закрывать(ся); *a* близкий, пристальный  
**closely** *adv* тесно, вплотную; пристально, внимательно (*наблюдать*); ~ **related** тесно связанный  
**closing day (month)** последний день (месяц)  
**clothes** *n pl* одежда  
**coat** *v* покрывать (*краской и т.п.*); *n* покрытие, слой  
**code** *n* код; *v* кодировать  
**coincide** *v* совпадать  
**cold** *n* холод; *a* холодный  
**collect** *v* собирать  
**combine** *v* соединять; сочетать; объединять; ~**d with** в сочетании с  
**combustion** *n* сгорание  
**combustible agent** горючее вещество  
**come (came, come)** *v* приходить; ~ **back** возвращаться; ~ **in** входить; ~ **though** проходить сквозь; проникать; ~ **to a conclusion** прийти к заключению; ~ **to light** появиться, выявиться; ~ **true** осуществиться  
**comet** *n* комета  
**commercial** *a* коммерческий; промышленный  
**common** *a* обычный; всеобщий; общепринятый  
**communicate (with)** *v* сообщаться; держать связь  
**communication** *n* связь, сообщение  
**comparatively** *adv* сравнительно  
**compare** *v* сравнивать; **as ~d to** по сравнению с  
**compartment** *n* отделение; отсек; кабина  
**compatibility** *n* совместимость  
**compile** *v* составлять  
**complete** *v* завершать(ся), заканчивать(ся); *a* полный, законченный; готовый; **a ~ piece** целое, готовое

**completely** *adv* полностью, целиком  
**complex** *a* сложный  
**complicated** *a* сложный  
**component** *n* часть, компонент (*машины, устройства*); ~ **parts** составные части  
**compose** *v* составлять; **to be ~d of** состоять (из)  
**composite** *a* составной, сложный  
**composition** *n* состав, смесь; сочинение  
**comprehend** *v* понимать  
**compress** *v* сжимать  
**comprise** *v* включать в себя; состоять (из)  
**compulsory** *a* обязательный  
**computation** *n* подсчет  
**computing device** счетно-решающее устройство; ~ **machine** вычислительная машина  
**concept** *n* концепция, понятие  
**conclusion** *n* заключение  
**condition** *n* условие, состояние  
**conductivity** *n* проводимость  
**confirm** *v* подтверждать, утверждать  
**confront** *v* **to be ~ed with** сталкиваться с чем-л.  
**connect** *n* соединять; ~**ing rod** шатун  
**consequence** *n* следствие; **in ~ of** в результате, вследствие  
**consequently** *adv* следовательно  
**conservation** *n* сохранение  
**consider** *v* считать; полагать, рассматривать, учитывать  
**considerable** *a* значительный  
**consideration** *n* расчет; **in ~ of** принимая во внимание; **take into ~** принимать во внимание, учесть (*в расчете*)  
**consist (of)** *v* состоять из; заключаться в чем-л.  
**constant** *a* постоянный  
**construct** *v* строить; конструировать  
**consumer** *n* потребитель  
**contain** *v* содержать  
**contemporary** *a* современный  
**content** *n* содержание; количество; **energy** ~ количество энергии  
**continue** *v* продолжать  
**continuous** *a* непривычный; непрерывный  
**contrary (to)** *adv* в противоположность, в отличие от; **on the ~** в противоположность  
**controversial** *adj.* противоречивый  
**contribute** *v* вносить (*вклад в науку*); давать  
**contribution** *n* вклад  
**control** *v* управлять, регулировать; *n* управление; ~ **engineering** техника управления; ~ **section (unit)** управляющее устройство  
**convenient** *a* удобный  
**convert** *v* преобразовывать, превращать  
**convey** *v* переправлять, доставлять  
**cool** *v* охлаждать; *a* прохладный  
**coordinate** *v* координировать, связывать  
**copper** *n* медь  
**corner** *n* угол; ~ **stone** краеугольный камень  
**correct** *v* исправлять; *a* правильный  
**correlate** *v* соотносить(ся)  
**correspond** *v* соответствовать

**cost (cost)** *v* стоить; *n* стоимость, цена  
**council** *n* совет  
**country** *n* страна  
**course** *n* течение, ход, курс (*наук*); ~ **of lectures** курс лекций; **in the ~ of** в ходе..., в процессе чего-л.  
**cover** *v* покрывать, охватить; пройти (*программу*); ~ **the course of** пройти курс  
**create** *v* создавать, творить  
**creative** *a* творческий; ~**ly minded** творчески мыслящий  
**cross** *v* пересекать, переходить; ~-**section** поперечное сечение  
**crucial** решающий  
**crude** *a* необработанный, грубый  
**crystal** *n* кристалл  
**culminate** *v* завершаться  
**culture** *n* культура  
**currency** валюта  
**current** *n* ток (*эл.*); *a* современный  
**curriculum (pl curricula)** *n* учебная программа  
**curtain** *n* штора, занавес  
**curvature** *n* кривизна, изгиб  
**cycle** *n* цикл  
**cylinder** *n* цилиндр

## D

**daily** *a* ежедневный; *adv* ежедневно  
**damage** *n* повреждение  
**danger** *n* опасность  
**dangerous** *a* опасный  
**dark** *a* темный; *adv* темно  
**darken** *v* затемнять; ~**ed** затемненный  
**data** *n, pl* данные (от *datum*)  
**date back** *v* относиться (*к определенной эпохе*)  
**deal (dealt)** *v (with)* иметь дело с  
**dean** *n* декан  
**death** *n* смерть  
**decade** *n* десятилетие  
**decide** *v* решать  
**declare** *v* заявлять, объявлять  
**decline** *v* отклонить (*предложение*)  
**decrease** *v* уменьшать(ся); *n* уменьшение  
**defect** *n* дефект, недостаток  
**defend** *n* защищать(ся)  
**define** *v* определять, давать определение, устанавливать  
**definite** *a* определенный, точный, отчетливый  
**definition** *n* определение  
**degree** *n* степень; **to get a ~** получить ученую степень  
**deliver** *v* представлять (*отчет*); доставлять; ~ **a lecture** прочитать лекцию; ~ **a report** сделать доклад  
**delve** *v* копать, углубляться  
**demand** *v* требовать; *n* требование  
**demonstrate** *v* демонстрировать, показывать



**demystify** демистифицировать  
**dense** *a* плотный; насыщенный; ~ **air** плотные слои атмосферы  
**depend (on, upon)** *v* зависеть (от)  
**depth** *n* глубина  
**derive** *v* устанавливать (выводить) закон (происхождение)  
**descend** *v* опускаться  
**describe** *v* описывать, изображать, характеризовать, называть; **to be ~ed as** называться  
**description** *n* описание, обозначение; вид, тип  
**design** *v* конструировать; проектировать; предназначать; *n* проект; план; расчет; конструкция; эскиз  
**desire** *v* желать; ~**ed** желательный, желаемый; *n* желание  
**desk** *n* парта; пульт; стол управления; ~ **type** настольный  
**despite** *prep* несмотря на, вопреки  
**detail** *n* подробность; *a* ~**ed** подробный  
**determination** *n* определение  
**determine** *v* определять, устанавливать  
**develop** *v* развивать, разрабатывать; создавать; проявлять (*фото*)  
**deviation** *n* отклонение, девиация  
**device** *n* устройство, механизм, прибор  
**devise** *v* изобретать, придумывать  
**devote** *v* посвящать; ~ **one's attention (to)** уделять внимание  
**diagram** *n* диаграмма  
**diameter** *n* диаметр  
**dictionary** *n* словарь  
**die** *n* умирать  
**differ** *v* отличаться (от)  
**difference** *n* отличие, разница  
**different** *a* различный, другой; **to be ~ from** отличаться от; **to be of ~ composition** иметь иной (другой) состав  
**difficult** *a* трудный  
**digital** *a* цифровой  
**direct** *v* руководить, направлять; *a* прямой, непосредственный; **in ~ consequence** как прямое следствие  
**direction** *n* направление  
**disability** *n* неспособность  
**disadvantage** *n* недостаток  
**disappear** *v* исчезать  
**discover** *v* открывать, обнаруживать  
**discuss** *v* обсуждать  
**discussion** *n* обсуждение  
**display** *v* показывать, проявлять (*чувства, свойства, способности*)  
**disposal** *n* распоряжение  
**dissimilarity** *n* несходство, различие  
**distance** *n* расстояние; **a long ~ ahead** далеко впереди, на большое расстояние вперед  
**distant** *a* отдельный; ~ **controlled= remote controlled** с дистанционным управлением  
**distinct** *a* отчетливый, ярко выраженный  
**distribute** *v* распределять, размещать  
**district** *n* район  
**divide** *v* делить  
**division** *n* деление  
**double** *v* удваивать; *a* двойной  
**doubt** *n* сомнение

**down** *adv* вниз  
**dozen** *n* дюжина  
**draw (drew, drawn)** *v* чертить; ~ **back** отдернуть, оттянуть, отодвинуть (назад)  
**drawing** *n* черчение  
**dream** *n* мечта; *v* (**dreamt or dreamed**) мечтать  
**drive (drove, driven)** *v* ездить (на автомобиле); приводить в движение; ~ **a car** водить автомобиль; *n* поездка (на автомобиле)  
**drop** *v* бросать, оставлять; ~ **the idea** перестать думать, отказаться от мысли; *n* капля  
**drug** *n* лекарство  
**due to** *prp* из-за, благодаря, вследствие; **to be** ~ являться результатом чего-л.; направляться куда-л.  
**during** *prp* в течение, во время  
**duty** *n* долг

## Е

**each** *a, pron* каждый; ~ **of** каждый из; ~ **one** каждый; ~ **other** друг друга; ~ **time** каждый раз; ~ **year** каждый год, ежегодно  
**early** *a* ранний; *adv* рано; ~ **in 19...** в начале 19...; **as ~ as** еще (так давно, как)  
**earn** *v* зарабатывать  
**earth** *n* земля  
**easily** *adv* легко  
**easy** *a* легкий; *adv* легко  
**economical** *a* экономичный; ~**ly** *adv* экономично  
**economy** *n* экономия  
**edge** *n* кромка, край  
**educate** *v* обучать, давать образование, воспитывать; ~**d** образованный; **to be ~d** иметь образование, быть образованным  
**education** *n* образование  
**effect** *n* действие, влияние, воздействие; последствия, результат; *v* воздействовать, осуществлять  
**efficiency** *n* к.п.д., производительность  
**effort** *n* усилие  
**elastic** *a* упругий  
**elect** *v* выбирать, избирать  
**electric** *a* электрический; ~ **conductivity** электропроводность; ~ **current** электрический ток  
**electricity** *n* электричество; ~ **generation station** электростанция  
**eliminate** *v* устранять, исключать; ликвидировать  
**ellipse** *n* эллипс, овал  
**elliptical** *a* овальный, эллиптический  
**else** *adv* еще  
**emerge** *v* возникать, появляться, исходить  
**eminent** *a* выдающийся  
**emit** *v* испускать, излучать, выделять  
**emphasis** *n* ударение, акцент  
**empire** *n* империя  
**employ** *v* использовать, употреблять, применять  
**empty** *a* пустой  
**enable** *v* помогать, давать возможность  
**enclose** *v* вкладывать (в письмо и т.п.); помещать; заключать (внутри чего-л.)  
**encryption** кодирование

**end** *v* кончать, кончаться; *n* конец  
**endow** *v* ~ **with** наделять, обеспечивать  
**enforce** *v* усиливать; принуждать  
**engage** *v* занимать; зацеплять  
**engine** *n* двигатель, мотор; ~ **cylinder** цилиндр двигателя  
**engineering** *n* техника; строительное дело; машиностроение; конструирование  
**enlarge** *v* увеличивать(ся), расширять(ся)  
**enormous** *a* огромный, колоссальный  
**enough** *adv* достаточно, довольно  
**ensure** *v* обеспечивать, гарантировать  
**enter** *v* входить; поступать (*в учебное заведение*)  
**enterprise** *n* предприятие  
**entire** *a* весь, целый, полный  
**environment** *n* среда  
**equal** *a* равный, одинаковый  
**equation** *n* уравнение  
**equip** *v* оборудовать, оснащать  
**equipment** *n* оборудование  
**equivalent** *n* эквивалент; *a* равноценный  
**erratically** *adv* неустойчиво  
**error** *n* ошибка; заблуждение  
**escape** *v* выходить; вырываться; ускользать; давать утку  
**especially** *adv* особенно, специально  
**essential** *a* основной, существенный  
**establish** *v* устанавливать, учреждать, основывать  
**esteem** *v* оценивать, считать, чтить  
**estimate** *v* определять, оценивать  
**etc.** (*сокр. лат. et cetera*) = **and so on** и так далее  
**evaluate** *v* оценивать; определять  
**even** *adv* даже  
**event** *n* событие; случай  
**ever** *adv* когда-либо, когда-нибудь; ~ **increasing** непрерывно (постоянно) возрастающий; ~ **moving** постоянно движущийся  
**every** *a* каждый; **everybody**=**every one** все; **everyone else** все остальные; **everyday life** повседневная жизнь; **everything else** все остальное  
**everywhere** *adv* везде, повсюду  
**evidence** *n* показания, свидетельство; доказательство; признак  
**exact** *a* точный  
**examine** *v* осматривать, проверять  
**example** *n* пример; **for** ~ например  
**excellent** *a* отличный; превосходный  
**except** *prp* за исключением, исключая; ~ **for** за исключением; ~ **that** за исключением (не считая) того, что  
**exceed** *v* превзойти  
**excess** *n* избыток, излишек; *a* лишний  
**exchange** *n* обмен  
**executable** выполняемый  
**exercise** *n* упражнение  
**exhaust** *n* выхлоп; *a* выхлопной; ~ **gas** выхлопной газ (*отработанный*); ~ **velocity** скорость при выходе из плотных слоев атмосферы  
**exhaustive** исчерпывающий  
**exhibition** *n* выставка

**exist** *v* существовать  
**existence** *n* существование  
**expand** *v* расширять(ся)  
**expect** *v* ожидать; предполагать  
**experience** *n* опыт; ~**d** *a* опытный  
**experiment** *n* опыт, эксперимент; *v* делать опыты, экспериментировать  
**explain** *v* объяснять  
**explode** *v* взрываться  
**exploration** *n* исследование  
**explore** *v* исследовать  
**expose** *v* подвергать (*действию*)  
**exposure** *n* воздействие, **on** ~ под действием  
**express** *v* выражать  
**extend** *v* простирается, распространяться; выступать (*за пределы чего-л.*)  
**extension** *n* расширение  
**external** *a* внешний, наружный  
**extreme** *a* крайний; чрезвычайный, экстремальный  
**extremely** *adv* чрезвычайно, крайне; очень

## F

**facilitate** *v* облегчать  
**facility** *n* возможность  
**fail** *v* разрушаться, не выполнить чего-л., провалиться на экзамене  
**failure** *n* разрушение, повреждение; выход из строя  
**fall (fell, fallen)** *v* падать; понижаться; *n* падение; *амер.* осень  
**fame** *n* слава, известность  
**familiar** *a* хорошо знакомый, известный, близкий; **to be** ~ **with** хорошо знать что-л.; быть знакомым с чем-л.  
**famous** *a* знаменитый  
**fan** *n* вентилятор  
**far** *a* далекий, дальний; *adv* далеко; ~ **away** далеко; ~ **reaching** далеко идущий; **as** ~ **back as** еще в...(году)  
**farther** *a* дальнейший; более отдаленный  
**fast** *a* быстрый; *adv* быстро; ~ **acting** быстродействующий; ~ **operating** быстродействующий  
**favourite** *a* любимый  
**feature** *n* особенность, характерная черта  
**feed (fed)** *v* питать; подавать (*топливо, сырье*); *n* питание  
**feel (felt)** *v* чувствовать; сознавать; ощущать  
**few** *a* мало; **a** ~ несколько, небольшое число  
**fiber** *n* волокно; ~ **structure** волокнистая структура  
**field** *n* область, отрасль; поле (*эл.*)  
**fight (fought)** *v* бороться; *n* борьба  
**fill** *v* наполнять(ся); заполнять; ~ **in** заполнять  
**final** *a* окончательный; последний  
**find (found)** *v* находить; ~ **out** выяснить; обнаружить; понять  
**finger** *n* палец  
**fire** *v* огонь; *n* огонь  
**first** *a* первый; *adv* сначала, прежде всего; впервые  
**fit** *v* приспособливать, прилаживать, подгонять; ~ **with** снабжать, оборудовать чем-л.  
**fix** *v* устанавливать, закреплять; ~**ed** неподвижный

**flame** *n* пламя  
**flat** *a* плоский  
**flesh** *n* тело  
**flight** *n* полет  
**floor** *n* этаж; пол  
**flow (flew, flown)** *v* течь, истекать; *n* течение  
**fluorescent** *a* светящийся, флуоресцентный  
**fluid** *n* жидкость; *a* жидкий  
**fly (flew, flown)** *v* летать; ~ **up** взлететь  
**follow** *v* следовать (за); следить, наблюдать (за); **as ~s** следующим образом  
**follower** *n* последователь  
**foe** противник  
**font** шрифт  
**for** *prep* для, за, в течение; ~ **a long time** в течение долгого времени; ~ **a number of years** в течение ряда лет; ~ **example**, ~ **instance** например; ~ **the first time** впервые; в настоящее время; *conj.* так как  
**force** *n* сила; действие; *v* давить; заставлять, вынуждать; **to be ~d** быть вынужденным  
**foreground** передний план  
**foreign** *a* иностранный; посторонний  
**forget (forgot, forgotten)** *v* забывать  
**form** *v* придавать (принимать) форму, образовывать(ся); *n* форма, вид; **in the ~ of** в виде  
**former** *a* прежний, бывший; первый (*из двух*); **the ~... the latter** первый... последний  
**fortification** *n* укрепление, фортификация  
**fortune** *n* богатство, состояние; удача  
**forward** *a* передовой, передний; *adv* вперед  
**found** *v* основывать  
**foundation** *n* основание  
**fraction** *n* доля, часть; дробь  
**fracture** *n* излом, часть, трещина; *v* дробить  
**fragment** *n* осколок, обломок  
**frame** *n* рама  
**free** *a* свободный; бесплатный; ~ **of charge** бесплатно  
**freedom** *n* свобода  
**frequently** *adv* часто  
**friction** *n* трение  
**front** *a* передний; *n* передняя сторона; фасад; **in ~ of** перед, впереди  
**fuel** *n* топливо; ~ **mixture** топливная смесь  
**fulfil** *v* выполнять  
**full** *a* полный

## G

**gain** *v* получать, приобретать  
**gallium** *n* галлий  
**gap** *n* пропуск, пустое место  
**gas** *n* газ; (*амер.*) бензин; *a* газовый  
**gear** шестеренка, зубчатая передача  
**general** *a* общий, главный; основной; ~ **engineering subjects** общетехнические дисциплины;  
**in ~** вообще  
**generally** *adv* обычно, вообще; ~ **speaking** вообще говоря  
**generate** *v* вырабатывать, производить, создавать

**generation** *n* поколение; образование (*пара*); повышение (*температуры*)  
**generator** *n* генератор  
**germanium** *n* германий  
**get (got)** *v* получать; достигать; ~ **an idea** получить представление; ~ **back** вернуться; ~ **free** освободиться; ~ **interested** заинтересоваться  
**gift** *n* способность, дарование; талант  
**gifted** *a* способный, одаренный, талантливый  
**give (gave, given)** *v* давать, отдавать; ~ **birth** родить; ~ **lectures** читать лекции; ~ **off** выделять; ~ **every opportunity** дать все возможности; ~ **a talk** побеседовать  
**glance** *n* беглый взгляд; **at a** ~ сразу, с первого взгляда  
**glow** *v* светиться  
**grant** *v* давать, разрешать; предоставлять; ~ **a degree** присуждать ученую степень  
**gravitation** *n* притяжение, тяготение  
**gravity** *n* сила тяжести, земное притяжение  
**great** *a* большой; великий; крупный; **a** ~ **number of** очень много, большое число; **to be of** ~ **importance** иметь большое значение; **to be of** ~ **interest** представлять большой интерес  
**greet** *v* приветствовать  
**grind (ground)** *v* шлифовать, точить  
**group** *n* группа, тип  
**grow (grew, grown)** *v* расти; ~ **into** разрастаться, превращаться в  
**growth** *n* рост  
**guide** *n* руководитель; **as a** ~ в качестве руководителя  
**gun** *n* пушка, орудие

## H

**half** *n* половина  
**hand** *n* рука; *v* вручать, передавать (**over**)  
**handle** *v* обращаться с чем-л.; ~ **the case** вести дело (*судебное*)  
**happen** *v* происходить, случаться  
**hard** *a* твердый; трудный; тяжелый; *adv* много; трудно  
**hardly** *adv* едва ли; с трудом  
**hardware** *n* аппаратное обеспечение  
**hate** *v* ненавидеть  
**have at one's disposal** иметь в распоряжении  
**head** *n* голова, головка (*двигателя*); глава, начальник  
**hear (heard)** *v* слышать  
**heat** *n* тепло; температура; нагрев; *v* нагревать; ~-**resisting** жаропрочный; ~ **treatment** термообработка  
**heating** *n* нагрев, нагревание  
**heaven** *n* небо  
**heavenly** *a* небесный; ~ **body** небесное тело  
**heavy** *a* тяжелый  
**height** *n* высота; вершина  
**helium** *n* гелий  
**help** *n* помощь; *v* помогать  
**hence** *adv* следовательно, отсюда  
**heterogeneous** *a* разнородный, гетерогенный  
**hidden** скрытый  
**high** *a* высокий; ~-**temperature alloy** жаропрочный сплав  
**hold (held)** *v* держаться, удерживать  
**homogeneous** *a* однородный, гомогенный

**honour** *n* честь  
**hope** *n* надежда; *v* надеяться  
**horizontal** *a* горизонтальный  
**horseless** *a* зд. самоходный  
**hot** *a* горячий  
**house** *n* дом; *v* вмещать, размещать; **to be ~ed** размещаться, помещаться  
**how** *adv* как, каким образом; ~ **long** сколько (*по времени*); ~ **many** сколько (*по количеству*); ~ **old** сколько лет (**по возрасту**)  
**however** *adv* однако; *conj* тем не менее  
**hue** оттенок  
**huge** *a* огромный  
**humanity** *n* человечество  
**hydrogen** *n* водород  
**hypothesis** *n* (*pl=theses*) гипотеза

## I

**idea** *n* мысль, представление  
**identical** *a* одинаковый; идентичный  
**i.e.=that is** то есть  
**ill** больной  
**illegal** *a* нелегальный, незаконный  
**illegible** неразборчивый  
**imagesetter** записывающее устройство  
**imagination** *n* воображение, фантазия  
**imagine** *v* представлять (*себе*), воображать  
**immediately** *adv* немедленно, сразу же, непосредственно  
**immortal** *a* бессмертный  
**impact** *n* воздействие  
**importance** *n* значение, важность; **to be of ~** иметь значение  
**important** *a* важный, значительный  
**impose** *v* налагать (*обязательство*)  
**impossible** *a* невозможный  
**impress** *v* производить (*большое*) впечатление; поражать  
**improve** *v* улучшать, совершенствоваться  
**improvement** *n* улучшение, усовершенствование  
**impurity** *n* примесь  
**inaccuracy** *a* неточность  
**include** *v* включать  
**increase** *v* увеличивать(ся)  
**indeed** *adv* действительно, в самом деле  
**indefinite** *a* неопределенный, неограниченный  
**independence** *n* независимость  
**indirect** *a* косвенный, непрямой  
**inertia** *n* инерция  
**inform** *v* сообщать, информировать  
**initiate** *v* вводить, положить начало  
**ink** *n* чернила, краска  
**input** *n* ввод; ~ **section** устройство для ввода информации  
**inside** *n* внутренняя часть; *a* внутренний; *adv, prep* внутрь, внутри  
**insist (on, upon)** *v* настаивать на чем-л.  
**install** *v* устанавливать, помещать; монтировать  
**instance** *n* пример; **for** ~ например

**integrate** *v* соединять, интегрировать  
**integrated circuit** интегральная схема  
**intelligible** *a* понятный, вразумительный  
**intend** *v* намереваться, предполагать (*сделать что-л.*); предназначать  
**intensify** *v* усиливать(ся)  
**intensity** *n* интенсивность, напряжение  
**interaction** *n* взаимодействие  
**intermediate** *a* промежуточный  
**internal** *a* внутренний; ~ **combustion engine** двигатель внутреннего сгорания  
**interrupt** *v* прерывать  
**interval** *n* промежуток; перерыв; интервал  
**intervention** *n* вмешательство  
**introduce** *v* вводить, внедрять; представлять, знакомить  
**introduction** *n* введение  
**introductory** *a* вводный, вступительный; предварительный  
**invent** *v* изобретать  
**invention** *n* изобретение  
**inverse** *a* противоположный, обратный  
**investigate** *v* исследовать, расследовать  
**invincible** неукротимый  
**invisible** *a* невидимый  
**invite** *v* приглашать  
**invoke** вызвать  
**involve** *v* вовлекать; включать в себя; ~**d (in)** связанный с чем-л., данный; **to be ~d in** быть связанным с чем-л.  
**iron** *n* железо; *амер.* чугун; ~ **oxide** окись железа  
**irresistible** *a* неотразимый  
**issue** *v* исследовать, выпускать, истекать (*о газе*); *n* номер, выпуск  
**italicized** *p. II* выделенный курсивом  
**italics** *n* курсив; **in** ~ выделенный курсивом  
**item** *n* пункт, отдельный предмет

## J

**jet** *n* струя, сопло; *a* реактивный; ~ **engine** реактивный двигатель; ~ **propelled** реактивный (самолет)  
**job** *n* работа  
**join** *v* присоединять(ся) (*к*); заниматься (*в*), поступать; ~ **together** соединять одно с другим  
**journal** *n* журнал (*научный*)  
**just** *adv* только, только что, как раз

## K

**keep (kept)** *v* держать, сохранять  
**key** *n* ключ  
**keyboard** *n* клавиатура  
**kick** *n* удар, толчок  
**kind** *n* вид, тип, характер; **all ~s of** всякие, самые разнообразные  
**know (knew, known)** *v* знать; ~*n a* известный  
**knowledge** *n* знания



## L

- labour** *n* труд, работа
- land** *n* земля; страна; *v* приземляться
- language** *n* язык
- lantern** *n* фонарь
- large** *a* большой, крупный; **a ~ variety** самые разнообразные
- laser** *n* лазер
- last** *v* продолжаться; *a* прошлый, последний; ~ **month** (year и т.п.) в прошлом месяце (*году и т.п.*); ~ **time** в прошлый раз; **at** ~ наконец
- late** *a* поздний; *adv* поздно; **to be** ~ опаздывать; **in the ~ sixties** в конце 60-х годов; **~er on** позднее, потом, в дальнейшем; **in ~er years** в последние годы
- lately** *adv* в последнее время, недавно
- latent power** потенциальная энергия
- latter (the l.)** последний (*из двух*)
- launch** *v* запускать; *n* запуск
- law** *n* закон
- lay (laid)** *v* класть, положить; ~ **the foundation** заложить основу, фундамент
- lead** *n* свинец; *a* свинцовый
- lead (led)** *v* вести, возглавлять; приводить к чему-л.
- learn (learnt, learned)** *v* учить, научиться; узнавать что-л.
- least** *n* наименьшее количество; **at** ~ по крайней мере (*по наименьшей мере*)
- leave (left)** *v* уходить, уезжать, оставлять
- lecture** *n* лекция; *v* читать лекцию
- length** *n* длина; отрезок, кусок
- lest** *conj* чтобы... не
- let** *v* давать, разрешать, позволять; ~'s **begin** начнем; ~'s **go** пойдете
- letter** *n* письмо; буква
- level** *n* уровень
- lie (lay, lain)** *v* лежать
- likely** *adv* вероятно, возможно
- limit** *v* ограничивать; *n* предел
- linear** *a* линейный
- link** *v* связывать, соединять; *n* звено, связь
- liquid** *n* жидкость; *a* жидкий
- listen (to)** *v* слушать
- little** *adv* мало, немного; *a* небольшой, маленький; ~ **by** ~ постепенно, понемногу
- live** *v* жить; ~ **up to** работать (*жить*) в соответствии с..., оправдать чьи-л. ожидания
- load** *n* нагрузка; *v* нагружать; ~**ing** загрузка, погрузка
- local** *a* местный
- locate** *v* поместить, расположить; определить местонахождение
- long** *a* длинный; *adv* долго; ~ **ago** давно; ~ **before** задолго до...; ~ **distance communication** дальняя связь; **no ~er** больше не...
- look** *n* взгляд, вид; *v* смотреть, выглядеть; ~ **at** смотреть; ~ **for** искать; ~ **upon** смотреть (*как на...*), рассматривать (*как...*)
- lose (lost, lost)** *v* терять, лишать
- love** *v* любить
- low** *a* низкий; ~**er** *a* нижний
- luck** *n* удача, везение
- lunar** *a* лунный; ~ **motion** движение луны

## M

- machine** *v* обрабатывать, подвергать механической обработке; *n* машина, станок; **~building** машиностроение; **~tool** станок
- machinery** *n* механизм машины; машинное оборудование
- main** *a* основной, главный; **the ~ thing** самое главное
- major** *a* главный, основной
- make (made)** *v* делать, производить, заставлять; **~ every effort** приложить все усилия; **~ friends** подружиться; **~ up one's mind** принять решение; **~ use of** использовать
- manipulate** *v* управлять (*станком*); обращаться с чем-л.
- mankind** *n* человечество
- manner** *n* способ, образ действий; манера; **in a ~ different from** не так, как..., иным способом; по-другому
- manufacture** *v* производить; обрабатывать; изготавливать; *n* производство; изготовление;
- mark** *n* отметка; *v* отмечать
- market** *n* рынок
- marry** *v* выходить замуж; жениться
- Mars** *n* Марс
- mass** *n* масса; *a* массовый; **~ production** массовое производство
- match** *v* соответствовать, подходить
- matter** *n* вещество; материя (*философ.*); сущность; дело; вопрос
- mean** *v* означать; *a* средний
- means** *n pl* средство, способ; устройство; **by ~ of** посредством, при помощи; **by no ~** ни под каким видом, ни за что
- meantime** *adv.* **in the ~** между прочим
- measure** *n* мера; *v* измерять
- measurement** *n* измерение
- mechanical** *a* механический; **~ engineer** инженер-механик; **~ engineering** машиностроение
- mechanics** *n* механика
- medium** *n* среда
- meet (met)** *v* встречать(ся), знакомить(ся); **~ the requirements (demands)** удовлетворять требования (*потребности*)
- member** *n* член; часть, деталь, элемент конструкции
- memory** *n* память; запоминающее устройство
- mendeleyevum** *n* менделевий
- mention** *v* упоминать; *n* упоминание
- merit** *n* достоинство, заслуга
- meter** *n* метр; счетчик, измеритель
- method** *n* метод, способ
- microscope** *n* микроскоп
- middle** *n* середина; *a* средний
- mile** *n* миля
- military** *a* военный; **~ engineer** военный инженер; **~ engineering** военное дело, военная техника
- mill** *n* завод
- mind** *n* память; мнение; мысль; **keep in ~** помнить, иметь в виду
- minute** *n* минута
- mirror** *n* зеркало
- miss** *v* пропустить; упустить (*возможность*)
- missing** *a* недостающий

**missile** *n* снаряд, ракета  
**mistake** *n* ошибка; **to be ~n** ошибаться  
**misunderstand** *v* неправильно понять  
**mix** *v* смешивать, перемешивать  
**model** *n* модель, образец  
**modern** *a* современный  
**momentum** *n* количество движения; кинетическая энергия  
**money** *n* деньги  
**monster** *n* чудовище  
**most** *n* большая часть; наибольшее количество; ~ **of** большинство, большая часть; ~ **widely** (**commonly**) **used** самый распространенный  
**mostly** *adv* главным образом, большей частью  
**motion** *n* движение  
**motor** *n* мотор, двигатель; автомобиль  
**mount** *v* устанавливать, монтировать  
**move** *v* двигаться; передвигать(ся); переезжать  
**movement** *n* движение  
**much** *a* много; ~ **more** гораздо больше  
**multiplication** *n* умножение  
**multiply** *v* умножать, увеличивать  
**mysterious** *a* таинственный

## N

**namely** *adv* а именно, то есть  
**native** *a* родной (*город, страна*)  
**nature** *n* природа; тип, вид  
**natural** *a* естественный; ~ **philosophy** физика  
**naval** *a* военно-морской; ~ **academy** академия; ~ **architecture** военно-морское строительство  
**navy** *n* военно-морской флот  
**near** *adv* около, близко  
**nearly** *adv* почти  
**necessary** *a* необходимый; *adv* необходимо  
**need** *n* необходимость, потребность; *v* нуждаться  
**negative** *a* отрицательный  
**neighbouring** *a* соседний, смежный  
**never** *adv* никогда; ~ **mind** ничего, не обращайтесь внимания  
**new** *a* новый; ~ **man** новичок  
**news** *n pl* новость, новости  
**next** *a* следующий; ~ **year** в будущем (следующем) году  
**night** *n* ночь  
**non-conducting** *a* непроводящий, изолирующий  
**non-conductor** *n* изолятор, диэлектрик  
**north** *n* север  
**notation** *n* система обозначения  
**note** *n* записка (*докладная*), заметка  
**nothing** ничего  
**notice** *v* замечать  
**noun** *n* существительное  
**novel** *n* роман; *a* новый, неизвестный  
**now** *adv* теперь, сейчас

**nowadays** *adv* в настоящее время, теперь  
**nowhere** *adv* нигде  
**nuclear** *a* ядерный; ~ **engineering** ядерная техника  
**number** *n* ряд; номер, число; **a ~ of ...** ряд, несколько  
**numerical** *a* числовой  
**numerous** *a* многочисленный

## О

**obey** *v* повиноваться  
**object** *n* предмет, дополнение; *v* возражать  
**obscure** неясный, мрачный  
**observation** *n* наблюдение  
**observe** *v* наблюдать, соблюдать  
**obtain** *v* получать, приобретать  
**occasion** *n* случай  
**occupation** *n* оккупация  
**occupy** *v* занимать  
**occur** *v* приходить (*на ум*); случаться, происходить  
**ocean** *n* океан  
**office** *n* контора; кабинет; министерство; учреждение  
**official** *n* чиновник; *a* официальный  
**often** *adv* часто  
**oil** *v* смазывать; *n* смазка, нефть  
**old** *a* старый  
**on** *prp* на, при, по  
**once** *adv* однажды, один раз; ~ **more** еще раз; **at** ~ сразу  
**one** : ~ **another** друг друга; ~ **by** ~ по одному, постепенно; ~ **day** однажды  
**only** *a* единственный; **the ~ way** единственный способ  
**opaque** *a* непрозрачный  
**open** *v* открывать(ся); *a* открытый  
**operate** *v* действовать, работать, приводить в действие  
**opinion** *n* мнение  
**opportunity** *n* возможность  
**oppose** *v* противодействовать; возражать  
**opposite** *a* противоположный  
**oppress** *v* угнетать  
**optical** *a* оптический  
**optics** *n* оптика  
**orbit** *n* орбита  
**order** : **in ~ to** для того чтобы  
**organize** *v* организовать  
**origin** *n* возникновение; происхождение; начало  
**original** *a* самостоятельный; первоначальный  
**oscillation** *n* отклонение; колебание; качание  
**other** *a* другой; ~**s** *n* другие, остальные  
**otherwise** *adv* иными (другими) словами, иначе (*говоря*)  
**outer** *a* внешний, наружный; ~ **space** космическое пространство, космос  
**outline** *n* очертание; *v* обрисовываться, очерчивать; описывать  
**output** *n* производительность; выход (*продукции*); ~ **section (device)** устройство для выхода информации (*в счетно-решающей машине*)

**outside** *a* внешний, наружный; *adv* снаружи  
**outstanding** *a* выдающийся, знаменитый  
**over** *prp* по, над; *adv* выше; **to be** ~ оканчиваться  
**overestimate** *v* переоценивать  
**overview** обозревать, обзор  
**overwhelm** сокрушать  
**owing to** *prp* благодаря; вследствие  
**own** *a* собственный  
**oxide** *n* окись

## Р

**parabolic** *a* параболический  
**parallel** *a* параллельный  
**partial** *a* частичный  
**partial result** промежуточный результат  
**partially** *adv* частично  
**particle** *n* частица  
**particular** *a* особенный; данный, определенный; **in** ~ в особенности, в частности  
**party** *n* партия  
**pass** *v* проходить; ~ **examinations (tests)** сдавать экзамены (зачеты)  
**passive** *a* пассивный  
**past** *a* прошлый, прошедший; *adv* через, сквозь; мимо  
**path** *n* путь; дорога; направление  
**pattern** *n* модель, образец  
**pay (paid)** *v* платить; ~ **attention (to)** обращать внимание (*на*)  
**peace** *n* мир  
**peculiarity** *n* особенность, отличительная черта  
**penetrate** *v* проникать  
**people** *n* люди, народ  
**per cent** *n* процент  
**per** *prp* за, на, в; ~ **hour (mile), etc.** в час, на милю и т.п.  
**perfect** *a* прекрасный; совершенный  
**perform** *v* выполнять  
**performance** *n* характеристика (*работы машины*), поведение  
**perhaps** *adv* может быть  
**period** *n* срок, период, время  
**periodical** *a* периодический  
**periodicity** *n* периодичность  
**permanent** *a* постоянный  
**permission** *n* разрешение  
**permit** *v* разрешать  
**person** *n* человек  
**phase** *n* фаза; стадия; ступень  
**phenomenon (pl phenomena)** *n* явление  
**Ph.D.** доктор философии (*ученое звание*)  
**photo** *n* фотография  
**physicist** *n* физик  
**piece** *n* деталь, узел; кусок; устройство  
**pillage** грабеж  
**pipe** *n* труба; трубка

**pit** *n* яма, углубление  
**place** *n* место; *v* помещать  
**plaintext** обычный текст  
**plane** *n* плоскость; *a* плоский  
**planetary** *a* планетный, планетарный  
**plant** *n* завод  
**pleasure** *n* удовольствие  
**plural** *n* множественное число  
**Plutonium** *n* плутоний  
**p.m. (=post meridiem)** *лат. adv* после полудня  
**point** *n* конец, острие; точка; вопрос; *v* указывать (**out**)  
**pointer** *n* стрелка, указатель  
**pole** *n* полюс  
**popular** *a* популярный; общественный  
**population** *n* жители, население  
**portable** *a* переносной, портативный  
**pose** представлять  
**position** *n* положение; пост; место; должность; позиция  
**possess** *v* обладать  
**possibility** *n* возможность  
**possible** *a* возможный; **as much as** ~ как можно больше  
**postulate** *v* постулировать, принимать без доказательств; ставить условием  
**pour** литься  
**power** *n* мощность; энергия; способность; власть; ~ **engineering** энергомашиностроение; ~  
**station** электростанция  
**powerful** *a* мощный, сильный  
**practical** *a* практический; ~ **training** практика, практические занятия  
**practice** *n* практика  
**praise** *v* хвалить  
**precede** *v* предшествовать  
**predetermined** *a* заранее установленный, предрешенный  
**predict** *v* предсказывать  
**prediction** *n* предположение; предсказание  
**preliminary** *a* предварительный  
**prepare** *v* готовить, подготавливать  
**present** *v* представлять (*статью, доклад*)  
**presently** *adv* сейчас, в настоящее время  
**press** *v* давить, прижимать; *n* пресс  
**pressure** *n* давление  
**prevent** *v* мешать; предотвращать  
**previous** *a* предшествующий  
**primitive** *a* простой; примитивный  
**principal** *a* главный  
**prize** *n* премия, награда  
**probably** *adv* вероятно  
**problem** *n* задача; проблема  
**procedure** *n* процедура  
**proceed** *v* продолжать, продвигаться вперед  
**processing** *n* обработка; технология; ~ **engineer** инженер-технолог  
**produce** *v* производить, создавать  
**producer** *n* производитель, изготовитель  
**product** *n* продукт; изделие; продукция; *лат.* произведение

**profound** *a* глубокий  
**programme** *n* программа  
**progress** *n* прогресс; успех; развитие  
**project** *n* проект; *v* проектировать; обдумывать план  
**prominent** *a* выдающийся  
**promise** *n* обещание; *v* обещать  
**promote** *v* повышать (*в должности*), продвигать  
**proof** *n* доказательство  
**propagation** *n* распространение (*движения*); продвижение  
**propellant** *n* топливо для двигателей внутреннего сгорания  
**proper** *a* правильный; надлежащий  
**properly** *adv* надлежащим образом  
**property** *n* свойство  
**proportion** *n* пропорция, соотношение; **in** ~ пропорционально  
**propose** *v* предлагать; вносить предложение  
**propulsion** *n* движение вперед; толчок  
**protect** *v* защищать  
**prove** *v* доказывать  
**provide** *v* снабжать  
**provided** *conj* в том случае, если  
**province** *n* *зд.* губерния  
**psychology** *n* психология  
**public** *a* общественный; народный  
**publication** *n* опубликование, издание  
**publish** *v* опубликовать, издавать  
**pulse** *n* пульс; импульс  
**pump** *n* насос; *v* качать, накачивать; ~ **in** накачивать; ~ **out** выкачивать  
**punched card** перфокарта  
**pupil** *n* ученик  
**pure** *a* чистый; без примесей (*металл*)  
**purpose** *n* цель, назначение  
**puzzle** *v* удивляться, изумляться

## Q

**qualification** *n* квалификация  
**qualified** *a* квалифицированный  
**quality** *n* качество  
**quantitative** *a* количественный  
**quantity** *n* количество  
**quantum** квант; ~ **mechanics** квантовая механика; ~ **theory** квантовая теория  
**quarter** *n* четверть  
**question** *n* вопрос; **in** ~ рассматриваемый, данный  
**quick** *a* быстрый  
**quite** *adv* совершенно, вполне; ~ **a number** довольно много

## R

**rack** *n* каркас  
**radar** *n* радар

**radiation** *n* радиация  
**radio** *n* радио; ~ **engineering** радиотехника  
**radius** *n* радиус  
**raise** *v* повышение; увеличение; *v* поднимать(ся), повышать(ся), возрастать  
**random** *adj.* случайный  
**range** *n* радиус действия; расстояние; ряд; диапазон; *v* простирается; колебаться в известных пределах  
**rate** *n* темп, скорость; **twice the** ~ в два раза быстрее  
**rather** *adv* весьма, довольно, очень; ~ **than** скорее, чем; а не...  
**ratio** *n* отношение; соотношение  
**reach** *v* достигать  
**react** *v* воздействовать; регулировать  
**reaction** *n* реакция; воздействие  
**read (read)** *v* читать  
**ready** *a* готовый; **to be** ~ быть готовым; **to get** ~ готовиться к чему-л.  
**real** *a* действительный, настоящий  
**realize** *v* действительно, в самом деле  
**really** *adv* понимать, отчетливо представлять, осуществлять  
**reason** *n* причина  
**reasonable** *a* разумный; приемлемый  
**receive** *v* получать, принимать  
**receiver** *n* приемник  
**recent** *a* последний, недавний, новый  
**recognition** *n* признание  
**recognize** *v* признавать  
**recommendation** *n* рекомендация  
**reconstruct** *v* реконструировать; переделывать  
**record** *v* записывать, регистрировать; *n* запись  
**reduce** *v* уменьшать  
**reduction** *n* снижение, уменьшение  
**refer (to)** *v* ссылаться (на), упоминать  
**reference book** *n* справочник  
**refined** *a* очищенный  
**refining** *n* очистка  
**reflect** *v* отражать(ся), размышлять  
**reflection** *n* отражение  
**refraction of light** *n* преломление света  
**refuse** *v* отказывать(ся)  
**register** *n* журнал; регистр; накопитель  
**regular** *a* обычный, регулярный  
**relation** *n* отношение, соотношение; взаимосвязь, родство  
**relative** *a* относительный  
**relatively** *adv* сравнительно, относительно  
**release** *v* выпускать  
**reliability** *n* надежность  
**reluctant** *a* неохотный  
**rely (on, upon)** *v* полагаться (на)  
**remain** *v* оставаться  
**remarkable** *a* замечательный, выдающийся  
**remember** *v* помнить  
**render** *v* отдать  
**repair** *v* ремонтировать, исправлять; восстанавливать



**repeat** *v* повторять  
**represent** *v* представлять; изображать  
**require** *v* требовать  
**requirement** *n* требование  
**rescuer** *n* спасатель  
**research** *v* исследовать; *n* исследование, исследовательская работа; **do** ~ вести исследовательскую работу; *a* научно-исследовательский  
**resist** *v* сопротивляться; оказывать сопротивление  
**respect** *n* отношение; **in all** ~s во всех отношениях; **in this** ~ в этом отношении  
**responsible** *a* ответственный; **to be ~ for** отвечать (за); быть ответственным за что-л.  
**rest** *n* покой, отдых; остаток; **the** ~ остальное, остальные; остаток  
**retire** *v* выходить в отставку, уходить на пенсию; удаляться  
**retrieve** отыскивать  
**return** *v* возвращать(ся); *n* возвращение; *a* обратный  
**revolve** *v* вращать(ся)  
**reward** *n* награда, вознаграждение; признание  
**rich** *a* богатый  
**right** *a* правый; правильный; *n* право  
**ring** *n* кольцо  
**rise (rose, risen)** *v* подниматься; увеличивать(ся); вставать  
**road** *n* дорога  
**roar** *n* рев  
**rocket** *n* ракета; *attr.* реактивный, ракетный  
**rod** *n* прут; брус; стержень  
**roll** *v* катать, прокатывать  
**roof** *n* крыша  
**room** *n* комната; помещение; место  
**root** *n* корень  
**rotate** *v* вращать(ся)  
**round** *a* круглый; *adv* вокруг  
**row** *n* ряд  
**rule** *n* власть, правило; **as a** ~ как правило; *v* править, управлять  
**run (ran, run)** *v* бежать; работать (*о машине*); **~ning speed** скорость езды; **~ning engine** работающий двигатель  
**rush** *v* устремляться, стремиться; спешить

## S

**safe** *a* безопасный; надежный  
**safety** *n* безопасность; ~ **device** предохранительное устройство  
**same** *a* тот же, такой же; **the** ~ то же самое; **in the** ~ **way** так же, таким же образом  
**satellite** *n* спутник  
**satisfactory** *a* удовлетворительный  
**satisfy** *v* соответствовать (удовлетворять) требованиям  
**scale** *n* масштаб; шкала; размер  
**scandium** *n* скандий  
**scanning** *n* развертка, сканирование  
**scarcely** *adv* едва, едва только  
**scattered** *a* разбросанный  
**schedule** *амер. n* расписание, график; план  
**scheme** *n* схема; план (*действия*)

**scholar** *n* ученый  
**science** *n* наука  
**scientific** *a* научный  
**scientist** *n* ученый  
**screen** *n* экран; щит; *v* защищать, отгораживать  
**seal** *n* изоляция; *v* изолировать; запечатывать  
**section** *n* разрез, сечение, профиль; отдельная деталь; узел (*машины*); блок, устройство (*счетно-решающей машины*)  
**seem** *v* казаться  
**seldom** *adv* редко  
**self-propelled** *a* самоходный  
**sell (sold)** *v* продавать  
**semiconductor** *n* полупроводник; *a* полупроводниковый  
**send (sent)** *v* посылать; отправлять  
**senior** *n* старший  
**sensitive** *a* чувствительный, восприимчивый  
**separate** *v* отделять(ся), разъединять(ся); *a* отдельный  
**sequence** *n* последовательность, ход (*действий, событий*)  
**series** *n* ряд, серия; **a ~ of** несколько, ряд; **in ~** последовательно  
**serve** *v* служить  
**service** *n* служба; заслуги; эксплуатация; *v* обслуживать  
**set** *n* набор, комплект; установка; *v* помещать, устанавливать; ~ **aglow** вызвать свечение; ~ **up** учреждать, устанавливать, организовать; *v* установка, группа (*машин, станков*)  
**several** *pron* несколько; ~ **times** несколько раз  
**severe** *a* сильный; тяжелый; большой (*о нагрузке*); ~ **stresses** большие напряжения  
**shadow** *n* тень  
**shaft** *n* вал, ось  
**shake (shook, shaken)** *v* качать(ся); потрясать  
**sharp** *a* резкий; острый  
**sheet** *n* лист (*бумаги, металла*)  
**shipbuilding** *n* судостроение  
**shortcoming** *n* недостаток  
**sight** *n* вид  
**similar** *a* подобный  
**similarity** *n* сходство, подобие  
**simple** *a* простой  
**simplicity** *n* простота  
**simplify** *v* упрощать  
**single** *a* один; единственный; отдельный  
**sink (sank, sunk)** *v* тонуть, погружаться  
**situation** *n* положение  
**size** *n* размер  
**skill** *n* умение, мастерство  
**skilled** *a* квалифицированный; умелый  
**skin** *n* кожа  
**slave** *n* раб, невольник  
**slow** *a* медленный; ~ **down** *v* замедлять  
**smile** *v* улыбаться; *n* улыбка  
**smoke** *n* дым; *v* курить  
**so** *adv* так, таким образом; ~ **as to** так, чтобы; ~-**called** так называемый; ~ **that** так, чтобы  
**society** *n* общество  
**sodium** *n* натрий

**soft** *a* мягкий; ~ **landing** мягкая посадка  
**software** *n* программное обеспечение  
**solar system** солнечная система  
**solid** *a* твердый, плотный; сплошной; *n* твердое тело; ~ **solution** твердый раствор  
**solution** *n* раствор; решение (*задачи*)  
**solve** *v* решать (*задачу*)  
**soon** *adv* скоро, вскоре; ~ **after** вскоре после; **as** ~ **as** как только, как можно скорее  
**sorry: to be** ~ сожалеть  
**sound** *n* звук; *a* звуковой; хороший, прочный; ~ **education** хорошее образование  
**source** *n* источник  
**space** *n* космос, космическое пространство; пространство, место; ~ **craft** космический корабль; ~ **exploration** исследование космоса; ~ **flight** космический полет; ~ **ship** космический корабль  
**spark** *n* искра; запал  
**special** *a* специальный, особый  
**specialize** *v* специализироваться  
**specific** *a* особый, характерный, специфический  
**specified** *a* указанный, определенный  
**spectacular** *adj.* эффективный  
**speed** *n* скорость; ~ **up** *v* ускорять  
**spend (spent)** *v* проводить, тратить (*время*)  
**spin** *v* кружиться, вертеться  
**spread** *v* распространять (*новость*)  
**square** *n* площадь; квадрат; *a* квадратный  
**squeeze** *v* обжимать; сжимать, сдавливать: ~ **out** выдавливать  
**staff** *n* штат; персонал  
**stage** *n* стадия; ступень  
**state** *n* государство; положение; *a* государственный; *v* гласить; устанавливать, излагать, сформулировать  
**static** *a* статический  
**station** *n* позиция, местоположение; станция, пункт  
**stay** *v* оставаться; остановиться; гостить у кого-л.  
**steady** *a* устойчивый, постоянный  
**steam** *n* пар; *a* паровой  
**steel** *n* сталь  
**step** *n* шаг; ступень; *v* шагнуть  
**still** *adv* все еще; однако; до сих пор  
**stone** *n* камень; *a* каменный  
**storage** *n* склад, хранилище; ~ **section** запоминающее устройство  
**store** *v* накапливать, собирать; хранить  
**straight** *a* прямой; *adv* прямо  
**strange** *a* странный  
**stream** *n* поток, струя  
**strength** *n* прочность; ~ **of materials** сопротивление материалов  
**strengthen** *v* укреплять, усиливать  
**stress** *n* напряжение, усилие; нагрузка; *v* подвергать напряжению, давлению  
**stretch** *v* растягивать; натягивать; удлинять  
**strike (struck, stricken)** *v* наносить удар; поражать, производить впечатление  
**string** *v* нанизывать  
**strong** *a* сильный; прочный  
**structure** *n* сооружение, конструкция; структура  
**subdivide** *v* подразделять

**subject** *n* предмет, тема, вопрос; *v* подвергать  
**submit** *v* представлять (*на рассмотрение*)  
**subsequent** *a* последующий  
**substance** *n* вещество  
**substitute** *v* заменять  
**subtract** *v* вычитать  
**subtraction** *n* вычитание  
**succeed (in)** *v* удаваться (*сделать что-л.*), следовать; **~ing** последующий  
**success** *n* успех; **to be a ~** иметь успех; быть удачным  
**such** такой; **~ as** такой как, подобный; **in ~ a way** таким образом  
**suddenly** *adv* внезапно, вдруг  
**sufficient** *a* достаточный; *n* достаточное количество  
**suffix** *n* суффикс  
**suggest** *v* предлагать; рекомендовать, советовать  
**suitable** *a* подходящий, пригодный; удобный  
**sum** *n* сумма; *v* **~ up** складывать, суммировать  
**supervise** *v* наблюдение  
**supplant** вытеснять  
**supply** *v* снабжать, доставлять, поставлять; сообщать (*энергию*); *n* запас  
**support** *v* поддерживать; *n* опора, подставка  
**suppose** *v* предполагать, полагать  
**sure** *a* уверенный; **to get ~** убедиться, удостовериться  
**surface** *n* поверхность; *a* наружный  
**surpass** *v* превышать, превосходить  
**surprise** *v* удивлять, поражать; *n* неожиданность  
**surrender** *v* сдавать(ся), уступать; отказываться от чего-л.  
**swing (swung)** *v* качаться, колебаться, поворачивать(ся)  
**switch** *n* выключатель, переключатель; *v* переключать; **~ off** выключать; **~ on** включать  
**systematize** *v* систематизировать

## Т

**table** *n* стол; таблица  
**tablet** плитка  
**take (took, taken)** *v* брать, взять  
**take off** *n* взлет; **~ off mass** взлетная (стартовая) полоса  
**talk** *v* разговаривать, беседовать; *n* беседа  
**tank** *n* бак; бассейн; танк  
**tape** *n* лента; пленка (*для магнитной записи*)  
**task** *n* задача; задание  
**taxes** *n pl* налоги  
**teach (taught)** *v* преподавать, учить, обучать  
**techniques** *n* техника; способы, методы, технические приемы  
**tedious** *a* утомительный; скучный  
**tell (told)** *v* сказать, сообщить  
**temperature** *n* температура  
**tendency** *n* тенденция, стремление  
**term** *n* термин, выражение; семестр; **in ~s of numbers** математически  
**territory** *n* территория  
**test** *v* испытывать, исследовать, пробовать, проверять; *n* испытание, проба, проверка; **~ work**  
 контрольная работа

**thank** *v* благодарить; **thanks to** *сj* благодаря  
**that is** то есть; ~ **is why** вот почему  
**then** тогда, затем; **the** ~ тогдашний  
**thereby** *adv* таким образом  
**therefore** *adv* поэтому  
**thermodynamics** *n* термодинамика  
**thick** *n* толстый  
**thing** *n* вещь  
**think (thought)** *v* думать  
**this time** на этот раз  
**thorough** *a* глубокий; тщательный; ~ **knowledge** глубокие знания  
**though** *сj* хотя; **as** ~ как если бы; как будто  
**thought** *n* мысль  
**through** *prp* через, сквозь  
**throughout** *adv* всюду, по  
**thrust** *n* тех. давление; нагрузка; толчок; напор  
**thus** *adv* таким образом; так  
**till** *prp* до; *сj* (до тех пор) пока  
**time** *n* время; период времени; *v* рассчитать (*по времени*); **by the** ~ к тому времени, как  
**tiny** *a* крошечный  
**tired** *a* утомленный, усталый  
**titanium** *n* титан  
**title** *n* титул, звание, название, заголовок  
**together** *adv* вместе  
**too** *adv* тоже, также; слишком  
**tool** *n* инструмент; станок  
**top** *n* верх, верхушка, верхняя часть  
**touch** *v* трогать; ~ **upon** касаться какого-л. вопроса; затрагивать какой-л. вопрос  
**towards** *prp* по направлению к чему-л.; по отношению к чему-л.  
**tragedy** *n* трагедия  
**train** *n* поезд, состав; *v* обучать  
**transfer** *v* передавать, перемещать, транспортировать; ~ **machines** автоматические линии; ~ **mechanism** транспортировочный механизм  
**transform** *v* преобразовывать  
**transformer** *n* трансформатор; преобразователь  
**transistor** *n* транзисторный приемник  
**translucent** просвечивающий  
**transmission** *n* передача  
**transmit** *v* передавать (*по радио*)  
**travel** *v* перемещаться, передвигаться, двигаться; *n* перемещение, передвижение; путешествие  
**treasure** *n* сокровище  
**treat** *v* обращаться (*с чем-л.*); обрабатывать  
**treatment** *n* обработка, обращение  
**tremendous** *a* громадный, огромный  
**trend** *n* направление (*в науке, технике*)  
**trial** *n* проба  
**trip** *n* *зд.* путешествие; полет, прилет  
**true** *a* правильный, справедливый  
**try** *v* пытаться, пробовать; стараться  
**tube** *n* труба; трубка  
**turbine** *n* турбина

**turn** *v* поворачивать(ся); выпускать (продукцию) (**out**); обтачивать; ~ **against** обернуться (*против кого-л.*); ~ **one's attention (to)** обратить внимание (на); ~ **back** обернуться; снова обратиться (к); ~ **into** превратиться в; ~ **to** обратиться к чему-л., кому-л.; ~ **up** выявиться, оказать(ся); *n* очередь; **in its** ~ в свою очередь

**twice** *adv* дважды

**type** *n* тип; вид

## U

**unable** *a* неспособный; **to be** ~ не быть в состоянии

**under** *prp* под; ~ **certain conditions** при определенных условиях

**undergo (underwent, undergone)** *v* подвергаться чему-л.

**undergraduate** *n* студент последнего курса

**underground** *n* (**the** ~) метро; *a* подземный

**unfortunately** *adv* к несчастью, к сожалению

**union** *n* союз

**unit** *n* единица (*оборудования*), блок, установка, узел, устройство, прибор

**universal** *a* всеобщий

**unless** *conj* если ... не

**unlike** *a* неодинаковый; *adv* в отличие от

**unravel** *v* открывать

**up to** *prp* до; **up-to-date** *a* современный

**upon** *prp* на; ~ **cooling** после охлаждения; ~ **to now** до сих пор, до настоящего времени

**usable** *a* пригодный для употребления

**use** *n* польза, употребление; **in** ~ в эксплуатации (употреблении); *v* использовать, употреблять

**utilize** *v* использовать

## V

**vacation** *n* каникулы

**vacuum** *n* вакуум; ~ **chamber** вакуумная камера

**valency** *n* валентность; ~=**valent** *attr* валентный

**valid** *a* правильный, обоснованный

**valuable** *a* ценный

**value** *n* значительность, ценность; значение

**valve** *n* клапан; электронная лампа

**variable** *n* переменная величина

**variation** *n* изменение, отклонение

**variety** *n* разнообразие; большое число

**vary** *v* менять(ся), изменять(ся)

**vehicle** *n* средство передвижения

**velocity** *n* скорость

**vendor** *n* продавец

**Venus** *n* Венера

**vertical** *a* вертикальный

**very** *adv* очень; **the** ~ тот самый; ~ **much** очень

**vibrate** *v* вибрировать, колебаться

**vice versa** *lat. adv* наоборот

**victory** *n* победа

**view** *n* вид; *v* осматривать, рассматривать  
**village** *n* деревня  
**virtue** *n* достоинство; **by ~ of** благодаря чему-л.  
**virus** вирус  
**visible** *a* видимый  
**visitor** *n* посетитель  
**vocabulary** *n* словарь  
**voltage** *n* напряжение, вольтаж  
**vote** *n* голос

## W

**wait** *v* ждать, ожидать  
**walk** *v* ходить, гулять  
**war** *n* война; *a* военный  
**watch** *v* наблюдать, следить, сторожить; *n* часы  
**water** *n* вода; *a* водный; ~ **system** водопровод  
**watertight** *a* водонепроницаемый  
**wave** *n* волна  
**way** *n* путь, дорога; способ; **in such a ~** таким образом; так что; **it this ~** так, таким образом; ~  
**out** выход, выход из положения  
**wax** воск  
**weigh** *v* взвешивать  
**weight** *n* вес, гиря  
**well** *adv* хорошо; **as ~ также**; **as ~ as** так же, как  
**whenever** *adv* как бы ни; всякий раз как  
**while** *conj* в то время, как; ~ **speaking** разговаривая; **for a ~** некоторое время  
**whole** *a* весь, целый; **the ~ of** весь, целый  
**wide** *a* широкий, обширный; **a ~ range of** много, большое число; **a ~ variety of** самые  
разнообразные  
**width** *n* ширина  
**wife** *n* жена  
**will** *v* хотеть, желать; **to be ~ing** очень хотеть  
**willingly** *adv* охотно  
**win (won)** *v* выиграть; ~ **a prize** получить премию; ~ **recognition** завоевать признание  
**winnow** *v* просеивать  
**wire** *n* проволока, провод; ~ **telegraph** телеграф  
**wireless** *n* радио  
**wish** *v* хотеть, желать; *n* желание  
**within** *prep* в, внутри, в пределах  
**without** *prep* без  
**withstand (withstood)** *v* выдерживать (*нагрузки, температуру*)  
**wonder** *n* чудо, изумление; *v* удивляться; хотеть знать что-л.  
**wonderful** *a* удивительный; замечательный  
**wood** *n* дерево  
**word** *n* слово  
**word-building** *n* словообразование  
**work** *n* работа; заготовка; деталь; *v* работать; ~ **out** разрабатывать; ~ **station** рабочая позиция  
**world** *n* мир; *a* всемирный; ~-**wide** всемирный; ~ **War II** вторая мировая война  
**worm** *n* червь

**worth** *a predict*: **to be** ~ заслуживать, стоить; **to be** ~-while заслуживать, стоить; ~-while **mentioning** заслуживать упоминания  
**worthy** *a* достойный  
**wrong** *a* не тот; неправильный; ошибочный

## X

**X-ray** *v* подвергать рентгеноскопии (просвечивать рентгеновскими лучами); ~ **unit** рентгеновская установка; *n pl* рентгеновские лучи

## Y

**year** *n* год; ~s **before** за ... лет до; ...~s **old** ...лет  
**yet** *adv* еще; однако, все же  
**yield** *v* приносить

## Z

**zink** *n* цинк



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### **The Department of Foreign Languages**

The department of foreign languages was established on 20 September 1931. At that time the first new structural subdivision was singled out and the first head of the department, the associate –professor Falk K.I. (1931-1941) was assigned.

13 teachers worked at the department, namely, 7 teachers of English and 6 teachers of German.

The department of foreign languages was headed by:

1941-1951 senior teacher Mitskevich Z.P.

1953-1973 senior teacher Lisikhina B.L.

1973-1993 senior teacher Dygina M.S.

Professor Markushevskaja L.P. has headed the department since 1993.

At present the department consists of four sections: English, French, Russian and German, 30 teachers working in the staff.

More than 60 manuals were published at the department. The electronic versions of English Grammar, Computer in Use, Optics have been designed. It helps students to improve their knowledge working on computers.

Much attention is given to working out different tests for distance education.

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