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Department for Language Studies

FOREIGN LANGUAGE

Methodological guidelines for the development translation skills of scientific and technical texts for level B1

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The present methodological guidelines are intended for the first-year students of pre-intermediate and intermediate level.

Special attention is drawn to the translation of authentic professional texts, compilation of terminological vocabulary, as well as doing lexical, grammar exercises.

Reviewer: Professor Salamatina A.M.

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Introduction

The present methodological guidelines are intended for the first-year students of intermediate level. Variety of useful and interesting texts you may find here. They might be used during the lesson as well as a self-study book. All the texts are actual and connected with their future specialty, especially for future power engineers. All the main topics are discussed concerning power engineering. Students may find the same themes here which they study. We start from the simplest and primitive approaching gradually the most complex aspects. At the very beginning students find and review Ampere's rule, all about magnets and heating effect of an electric wire. There are some interesting facts from the history of dynamo, its invention and use, generators, and alternators, the first inventors in the field of electricity. All the special terms are given, especially those which relate to specialty. There are also such facts as Benjamin Franklin the inventor of the lightning conductor, the facts how he made that famous invention which serves us nowadays. Students may also find very useful information concerning electrical wires and how to use them safely. Reading the texts and doing exercises afterwards introduces students with it much closer. After text exercises contain variety of tasks checking up understanding of the text. Those texts which are a little bit more difficult than the rest contain vocabulary where students will find not only the translation of unfamiliar words but also their definitions in English. If you know what aspects you have difficulty with, go straight to the texts that deal with them, using the Contents to help you find the relevant text. You can use the texts in several ways. You can just read the text and translate it with a vocabulary below. On the other hand, if the text is not difficult for you it is not necessary to search for the words in vocabulary but to do the exercises instead, for better understanding of the text. All the texts contain up-to-date information and actual in modern life.

Read and translate the text.

Magnetic effect of an electric current

The invention of the voltaic cell in 1800 gave electrical experimenters a source of a constant flow of current. Seven years later the Danish scientist and experimenter Oersted, decided to establish the relation between a flow of current and a magnetic needle. It took him at least 13 years more to find out that a compass needle is deflected when brought near a wire through which the electric current flows. At last, during a lecture he adjusted, by chance, the wire parallel to the needle. Then, both he and his class saw that when the current was turned on, the needle deflected almost at right angles towards the conductor. As soon as the direction of the current was reversed, the direction the needle pointed in was reversed too.

Everyone knows the rule thanks to which we can always find the direction of the magnetic effect of the current. It is known as Ampere's rule. Ampere established and proved that magnetic effects could be produced without any magnets by means of electricity alone. He turned his attention to the behavior of the electric current in a single straight conductor and in a conductor that is formed into a coil, i.e., a solenoid. When a wire conducting a current is formed into a coil of several turns, the amount of magnetism is greatly increased.

It is not difficult to understand that the greater the number of turns of wire, the greater is the m.m.f. (that is the magnetomotive force) produced within the coil by any constant amount of current flowing through it. In addition, when doubling the current, we double the magnetism generated in the coil.

A solenoid has two poles which attract and repel the poles of other magnets. While suspended, it takes up a north and a south direction exactly like the compass needle. A core of iron becomes strongly magnetized if placed within the solenoid while the current is flowing.

When winding a coil of wire on an iron core, we obtain an electromagnet. That the electromagnet is a controllable and reliable magnet is perhaps known to everyone. It is, so to say, a temporary magnet provided by electricity. Its behavior is very simple. The device is lifeless unless an electric current flow through the coil. However, the device comes to life provided the current flows. The iron core will act as a magnet if the current continues to pass along the winding.

Vocabulary.

Ampere's rule – the relationship between magnetic force and electric current (правило Ампера).

Deflect – cause (something) to change direction (отклонить).

Iron core – железное ядро

Magnetomotive force – магнитодвижущая сила

Reverse – move backwards (повернуть вспять).

Solenoid – a cylindrical coil of wire acting as a magnet when carrying electric current (соленоид).

Wind – move in or take a twisting or spiral course (наматывать).

Voltaic cell – гальванический элемент

Exercise 1. Decide if the sentences are true (T) or false (F).

1. A compass needle is deflected when brought near a wire. T/F.
2. Every coil is a solenoid. T/F.
3. M.m.f. is the magnetomotive force. T/F.
4. Every solenoid has two poles. T/F.
5. Every device comes to life provided the current flows. T/F.

Exercise 2. Answer the questions.

1. What was a source of a constant flow of current?
2. What did Ampere establish?
3. What is a solenoid?
4. What is an electromagnet?
5. Describe its behavior.
6. What is the function of an iron core?

Exercise 4. Translate the following sentences using the key words from the vocabulary above.

1. Amperage is the strength of an electric current needed to make a piece of electric equipment work.
2. Ampere is the standard unit of measurement for the strength of an electric current.
3. The journalists were frustrated by her constant deflection of their questions.
4. Magnetic field is an area around a magnet or something magnetic, in which its power to attract objects to itself can be felt.
5. Voltage is the force of an electric current, measured in volts.

Read and translate the text.

Heating effect of an electric current

The production of heat is perhaps the most familiar among the principal effects of an electric current, either because of its development in the filaments of the electric lamps or, may be, because of the possible danger from overloaded wires.

As you know, of course, a metal wire carrying a current will almost always be at a higher temperature than the temperature of that very wire unless it carries any

current. It means that an electric current passing along a wire will heat that wire (and may even cause it to become red-hot). Thus, the current can be detected by the heat developed provided it flows along the wire.

The reader is certain to remember that the heat produced per second depends both upon the resistance of the conductor and upon the amount of current carried through it. As a matter of fact, if some current flowed along a thin wire and then the same amount of current were sent through a thicker one, a different amount of heat would be developed in both wires. When the current is sent through the wire which is too thin to carry it freely, then more electric energy will be converted into heat than in the case of a thick wire conducting a small current.

Let us suppose now that a small current is flowing along a thick metal conductor. Under such conditions the only way to discover whether heat has been developed is to make use of a sensitive thermometer because the heating is too negligible to be detected by other means. If, however, our conductor was very thin while the current was large the amount of generated heat would be much greater than that produced in the thick wire. In fact, one could easily feel it. Thus, we see that the thinner the wire, the greater the developed heat. On the contrary, the larger the wire, the more negligible is the heat produced.

Such heat is greatly desirable at times but at other times we must remove or, at least, decrease it as it represents a waste of useful energy. In case heat is developed in a transmission line, a generator, or a motor, it is but a waste of electric energy and overheating is most undesirable and even dangerous. It is this waste that is generally called "heat loss" for it serves no useful purposes and does decrease efficiency. Nevertheless, one should not forget that the heat developed in the electric circuit is of great practical importance for heating, lighting, and other purposes. Owing to it we are provided with many appliances, such as: electric lamps that light our homes, streets and factories, electrical heaters that are widely used to meet industrial requirements, and a hundred and one other necessary and irreplaceable things which have been serving mankind for so many years.

In short, many of the invaluable electrical appliances without which life would seem strange and impossible at present can be utilized only because they transform electric energy into heat.

The production of heat by an electric current is called heating effect. One might also name its light effect provided the heat in the conductor be great enough to make it white-hot, so that it gives off light as well as heat. Take the filament of an electric lamp as an example. We know it to glow because of heat. By the way, were we able to look inside a hot electric iron, we should see that its wires were glowing too? A similar statement could be applied as well to almost any electric heating device. All of them give off a little light and a lot of heat.

Vocabulary.

Decrease – to become less, or to make something become less (снижаться, уменьшение, понижение).

Filament – a thin wire, especially one which lights up inside an electric light bulb (нить накала).

Irreplaceable – too special, unusual, or valuable to replace with something or someone else (незаменимый).

Negligible – too slight or small in amount to be of importance (незначительный).

Owing to – because of (благодаря).

Sensitive – sensitive equipment can record small changes (чувствительный, чуткий).

Utilize – to use something in an effective way (использовать, утилизировать).

Exercise 1. Decide if the sentences are true (T) or false (F).

1. An electric current passing along a wire will heat that wire (and may even cause it to become red-hot). T/F.
2. The current can be detected by the heat developed provided it flows along the wire. T/F.
3. The heat developed in the electric circuit is of great practical importance for heating, lighting, and other purposes. T/F.
4. The production of heat by an electric current is called heating effect. T/F.
5. The filament of an electric lamp glow because of heat. T/F.

Exercise 2. Find adjectives among the following words.

Heat, possible, electric, current, thin, wire, thick, electric, energy, sensitive, thermometer, useful, undesirable, dangerous, electrical, appliances, heating, effect, electric iron, electric heating device.

Exercise 3. Answer the questions.

1. What is perhaps the most familiar effect of an electric current?
2. How can the current be detected?
3. What wire do we need to get more heat?
4. Is the thin wire more effective for heat production?
5. Do we always need too much heat for our electric appliances?
6. What is heating effect?
7. Can we also call it light effect?

Exercise 4. Translate the following sentences using the key words from the vocabulary above.

1. There is something wrong with the electrics.
2. Wire is metal drawn out into the form of a thin flexible thread or rod.
3. Changes in the levels of vitamins can affect energy and well-being.
4. He said that the risks were negligible.
5. His reading was hesitant owing to a stammer.

Read and translate the text.

Generators

The dynamo invented by Faraday in 1831 is certainly a primitive apparatus compared with the powerful, highly efficient generators and alternators that are in use today. Nevertheless, these machines operate on the same principle as the one invented by the great English scientist. When asked what use his invention had, Faraday asked in his turn: "What is the use of a new-born child?" As a matter of fact, "the new-born child" soon became an irreplaceable device we cannot do without.

Although used to operate certain devices requiring small currents for their operation, batteries and cells are unlikely to supply light, heat, and power on a large scale. Indeed, we need electricity to light up millions of lamps, to run trains, to lift things, and to drive the machines. Batteries could not supply electricity enough to do all this work.

That dynamo-electric machines are used for this purpose is a well-known fact. These are the machines by means of which mechanical energy is turned directly into electrical energy with a loss of only a few per cent. It is calculated that they produce more than 99.99 per cent of all the. world's electric power.

There are two types of dynamos, namely, the generator and the alternator. The former supplies DC which is similar to the current from a battery and the later, as its name implies provides AC.

To generate electricity both must be continuously provided with energy from some outside source of mechanical energy such as steam engines, steam turbines or water turbines, for example.

Both generators and alternators consist of the following principal parts: an armature and an electromagnet. The electromagnet of a DC. generator is usually called a stator for it is in a static condition while the armature (the rotor) is rotating.

Alternators may be divided into two types: 1. alternators that have a stationary armature and a rotating electromagnet; 2. alternators whose armature serves as a rotor but this is seldom done. To get a strong e.m.f., the rotors in large machines rotate at a speed of thousands of revolutions per minute (r.p.m.). The faster they rotate, the greater the output voltage the machine will produce.

To produce electricity under the most economical conditions, the generators must be as large as possible. In addition to it, they should be kept as fully loaded as possible all the time. It is interesting to note here that the biggest generators ever installed at any hydroelectric station in the world are those installed in Russia. As you are likely to remember the Bratskaya hydroelectric station is equipped with 225,000 kilowatt (kW) generators. Russian scientists constructed more powerful generators which are installed at the Krasnoyarskaya station. The Konakovskaya, the Zaporozhskaya and the Uglegorskaya steam power-stations have large, rated capacity. Our industry produces even greater power installations of 1,200 MW for

the steam power plants which play such an important part in the electrification plan of Russia.

Vocabulary.

Alternator – a device which produces AC electricity (генератор переменного тока).

Alternating current – electrical current which regularly changes the direction in which it moves (переменный ток).

Armature – броня (кабеля).

Direct current – electrical current which moves in one direction only (постоянный ток).

Electromagnet – a device made from a piece of iron that becomes magnetic when a changing current is passed through the wire that goes round it (электромагнит).

Irreplaceable – too special, unusual, or valuable to replace with something or someone else (незаменимый).

Rotor – a part of a machine that spins, especially the device supporting the spinning blades of a helicopter (ротор, несущий винт).

Stator – статор

Exercise 1. Decide if the sentences are true (T) or false (F).

1. The dynamo was invented by Faraday in 1831. T/F.
2. It is a primitive apparatus compared with the powerful, highly efficient generators and alternators that are in use today. T/F.
3. Nevertheless, these machines operate on the same principle as the one invented by the great English scientist. T/F.
4. The dynamo-electric machines are the machines by means of which mechanical energy is turned directly into electrical energy with a loss of only a few per cent. T/F.
5. Both generators and alternators consist of the following principal parts: an armature and an electromagnet. T/F.

Exercise 2. Find verbs among these words.

Produce, capacity, play, note, economical, conditions, install, loaded, rotate, voltage, stationary, imply, supply, require, invent, equip, turn, calculate, current.

Exercise 3. Answer the questions.

1. When was the dynamo invented?
2. Who invented the dynamo?
3. What are the two types of dynamos?
4. What are the principal parts of alternators and generators?
5. What is the usual size of generators and what are the reasons of it?

Exercise 4. Translate the following sentences using the key words from the vocabulary above.

1. Alternator is a device which produces AC electricity.
2. Alternative energy is the energy from moving water, wind, the sun, and gas from animal waste.
3. Current is a movement of water, air, or electricity, in a particular direction.
4. Switch off the electric current before touching that machine.
5. If something is electromagnetic it has magnetic and electrical parts.

Read and translate the text.

Famous inventors in the field of electricity

The Scottish inventor James Watt improved the design of the early steam engine, ensuring that it could be used successfully throughout industry. He refined the steam engine designed by the English engineer Thomas Newcomen (1663–1729) and made it more efficient.

Watt's work helped to bring about the industrial revolution in Britain. The new Watt steam engines provided much of the power for Britain's industries during the 1800s. The watt (W), the unit of work or power, is named for James Watt. The power of most electrical devices, such as light bulbs and heaters, is rated in watts.

The English physicist James Prescott Joule is famous for his experiments with heat. He discovered that the various forms of energy – mechanical, electrical, and heat – are basically the same and that one form can be changed into another. Joule's research was so significant that his name was given to a unit of work or energy, the joule (j). Joule did not have any formal academic training or an academic post. However, he worked with some of the leading scientists of the time, including the English chemist John Dalton (1766–1844), and the Scottish physicist Lord Kelvin (1824–1907).

Exercise 1. Find the words with the same meaning.

1. Improve	A. Прибор
2. Bring about	B. Измерять
3. Device	C. Электрическая лампа
4. Refine	D. Улучшать
5. Unit	E. Исследование
6. Steam engine	F. Нагреватель
7. Light bulb	G. Очищать
8. Research	H. Осуществлять
9. Heater	I. Единица (измерения)
10. Rate	J. Паровой двигатель
11. Ensure	K. Быть известным (чем-то)
12. However	L. Значительный

13. Significant	M. Гарантировать
14. Academic	N. Учёный
15. Be famous (for smth.)	O. Однако, тем не менее

Exercise 2. Say if the following statements are false or true.

1. James Watt was the first to invent the steam engine. T/F.
2. His invention brought about the industrial revolution in Britain because his steam engine worked more efficient. T/F.
3. The watt is the unit of work of power. T/F.
4. The power of most electronic devices is rated in watts. T/F.
5. The Scottish physicist James Prescott Joule was famous for his experiments with heat. T/F.
6. He discovered that various forms of energy have the same basis and that one form can change into another. T/F.
7. Joule's name denotes a unit of work of energy. T/F.
8. He had a brilliant academic education. T/F.

Exercise 3. Find synonyms in the following list of words.

To convert into; to classify into; to provide; substance; to transfer from; to refine; matter; amount; to produce; to occur; to use; to turn into; to purify; to exploit; to get; to generate; quantity; to make up; to raise; different; to divide into; to switch from; to happen; to result in; various; to give; to obtain; way; to increase; method; to compose, to lead to.

Read and translate the text.

Electricity

Electricity is a flow of negative charges called electrons. (Electrons are particles that form a part of all atoms.) These electric charges are measured in units called coulombs. Electricity is a very versatile form of energy that can be converted into many other forms of energy, including light and heat, direct current (DC), which flows in one direction only, and alternating current (AC), which changes direction 60 times per second.

An electric circuit is an unbroken conducting path from, and back to, a power supply. It has three main parts: the power supply, the conductor, and the load. The power is provided by a generator or battery, the conductor carries the current, and the load is an electric device such as a lamp.

Unlike current electricity, static electricity does not flow. It is created when an electrically neutral substance loses or gains electrons (negatively charged particles), making it, respectively, positively, or negatively charged. You can create static electricity by rubbing a balloon on your clothing. Electrons will move from the clothing to the balloon, making the balloon negatively charged and the clothing

positively charged. The resulting static electricity on each will attract small, light objects such as pieces of paper.

Exercise 1. Find the words with the same meaning.

1. Direct current	A. Лёгкий
2. Conductor	B. Притягивать
3. Charge	C. Постоянный ток
4. Circuit	D. Измерять
5. Alternating current	E. Дорожка
6. Resulting electricity	F. Проводить
7. Power supply	G. В отличие от
8. Attract	H. Заряд
9. Respectively	I. Нагрузка
10. Load	J.Электрическая цепь
11. Measure	K. Переменный ток
12. Particle	L. Многосторонний
13. Coulomb	M. Соответственно
14. Carry	N. Частица
15. Versatile	O. В секунду
16. Light	P. Неразрывный
17. Unlike	Q. Кулон
18. Per second	R. Проводник
19. Path	S. Источник тока
20. Unbroken	T.Остаточное электричество

Exercise 2. Find nouns in the list of words.

Charge, flow, electricity, convert, energy, heat, current, power, device, load, direction, balloon, create, conductor, supply, attract, objects.

Exercises 3. Find the end of the sentences.

1. Electricity is _____.
2. Electrons are _____.
3. Electric charges are measured in _____.
4. Electricity is a very versatile form of energy because _____.
5. Direct current flows _____.
6. Alternating current changes _____.
7. An electric circuit is _____.
8. The power supply, the conductor and the load are _____.
9. Static electricity is created when _____.
10. Static electricity can be created with the help of a balloon by _____.
11. Small and light objects like pieces of paper are attracted by _____.

Exercise 4. Answer the following questions.

1. How is electricity rated?
2. What can be electricity converted into?
3. What are AC and DC?
4. What are the functions of the generator, the conductor, and the load?
5. How is static electricity produced?
6. How are the clothing and a balloon charged when rubbed together?
7. What can the resulting electricity affect?

Read and translate the text.

Energy

Everything happens because of energy. Without it there would be no life on Earth. Scientists classify energy into several different types, including chemical energy, light energy, and nuclear energy. Most types of energy can switch from one form to another. It is when energy switches form that things happen, or work is done. In a car, for example, gasoline provides chemical energy, which turns into mechanical energy, heat energy, electrical energy, and sound energy when the engine is started.

Scientists divide energy into seven main types. These include heat energy, which raises the temperature of matter, electrical energy, which converts into other energy forms, including heat and light, and chemical energy, contained in fuels. All energy that comes directly or indirectly from the Sun is known as radiant energy and makes up the electromagnetic spectrum.

Heat is a form of energy that transfers from one object or body to another if there is a difference in temperature between the two. When you are hot, for example, and the air outside your body is cooler, you lose heat to the air. A change in a body's level of heat results in a change in the energy of its molecules. This gives rise to a temperature change, which may in turn lead to a change of state.

Almost any form of energy can be converted into electricity. The most common methods of producing electricity are those used in batteries or generators. Power from batteries is generated by converting chemical energy into electrical energy. Most generators convert heat energy (from burning fuel) into electrical energy. Some generators exploit such natural resources as sunlight or wind to obtain electrical energy.

The different behavior of matter in its solid, liquid, and gaseous states is explained by kinetic theory. The state of any matter is determined by the amount of energy contained inside its atoms (the tiny particles that make up all matter). Changes of state occur when the energy levels of atoms change. The atoms in a gas have the most energy. The total amount of energy contained by the atoms of a substance is known as the kinetic energy of the substance. The substance's

temperature and the pressure it is under affect its kinetic energy; so, does the volume of its container.

Vocabulary.

Battery – a device that produces electricity to provide power for radios, cars, etc. (аккумулятор).

Behavior – someone's behavior is how they behave (поведение, режим).

Container – a hollow object, such as a box or a bottle, which can be used for holding something, especially to carry or store it (контейнер, резервуар, сосуд).

Exploit – to use something for advantage (эксплуатировать).

Generator – a machine which produces something, especially electricity (генератор).

Spectrum – the set of colors into which a beam of light can be separated, or a range of waves, such as light waves or radio waves (спектр).

State – a condition or way of being that exists at a particular time (состояние).

Substance – material with a particular physical characteristic (субстанция, вещество).

Volume – the amount of space that is contained within an object or solid shape (объём).

Exercise 1. Find equivalents of the following words.

1. Solid	A. Материя
2. Substance	B. Состояние
3. Give rise to	C. Твердое тело
4. Obtain	D. Обеспечивать
5. Occur	E. Вещество
6. Make up	F. Определять
7. Switch from	G. Давление
8. Matter	H. Получать
9. Convert into	I. Составлять
10. Fuel	J. Источник
11. Volume	K. Включать
12. Provide with	L. Топливо
13. Include	M. Объем
14. State	N. Превращаться в
15. Determine	O. Происходить
16. Pressure	P. Переходить из
17. Affect	Q. Иметь результатом
18. Result in	R. Содержать
19. Source	S. Влиять
20. Contain	T. Приводить к

Exercise 2. Find adjectives among the following list of words.

Several, different, chemical, nuclear, light, solid, liquid, kinetic, electrical, mechanical, converted, generated, tiny, change, radiant.

Exercise 3. Find the best ending of the sentence.

1. There are seven main types of energy including _____.
2. Most types of energy can _____.
3. The energy that comes from the Sun is _____.
4. Radiant energy composes _____.
5. The energy which raises the temperature of matter is called _____.
6. The energy contained in fuels is known as _____.
7. Temperature change of a body may lead to _____.
8. Electrical energy can be obtained from _____.
9. Some generators exploit such natural resources as _____.
10. Kinetic theory explains _____.
11. Changes of state occur when _____.
12. The kinetic energy of the substance is known as _____.

Exercise 4. Answer the following questions.

1. What wouldn't we exist on Earth without?
2. How does the energy switch from one form to another in a car?
3. When does heat energy occur?
4. What can a change in a body's level of heat result in?
5. What are the most common methods of producing electricity?
6. What natural resources do the generators use to produce electricity?
7. What is the state of any matter determined by?
8. What are atoms?
9. When does the change of a state happen?

Read and translate the text.

Electromagnetism

Electricity and magnetism combine to form one of the fundamental forces of the universe – electromagnetism. The two constantly interact, and the relationship between them is one of the most important in physics. For example, an electric current passing through a wire creates a magnetic field; and if the lines of force around a magnet are cut by a moving conductor, an electric current will be produced.

Magnets are attracted to iron and to any material that contains iron. Magnets have two poles, a north pole, and a south pole. Unmagnetized iron and steel have magnetic regions of atoms called domains that are jumbled up and point in lots of different directions. When iron or steel becomes magnetized, the domains become

aligned, and they all point in the same direction. One end of each domain points toward the magnetic north pole.

Electronics is a new branch of physics, and one that plays an increasingly important part in our lives. It is concerned with the use of electricity to produce signals that carry information and control devices such as computers. These devices contain electric circuits through which electric current flows. The controlling parts in a circuit are called components, and these include diodes and transistors. Components can amplify currents, switch them on and off, or change their direction.

Exercise 1. Find the words with the same meaning.

1. Domain	A. Часть
2. Amplify	B. Выключать
3. Interact	C. Устройство
4. Jumble up	D. Создавать
5. Cut	E. Течь
6. Point	F. Пересекать
7. Align	G.Беспорядочно
8. Universe	H. Область; регион
9. Create	I.Расширять
10. Contain	J. Содержать
11. Device	K. Выравниваться
12. Switch off	L. Указывать
13. Region	M. Домен
14. Direction	N. Область; сфера
15. Field	O. Вселенная
16. Be concerned	P. Отрасль
17. Part	Q.Взаимодействовать
18. Branch	R. Немагнитный
19. Flow	S. Заниматься
20.Unmagnetized	T. Направление

Exercise 2. Complete the sentences.

1. The relationship between electricity and magnetism is called _____.
2. Magnets are attracted to _____.
3. Magnets have two _____.
4. Domains are _____.
5. Domains become aligned and point to the same direction when _____.
6. Electronics is concerned with _____.
7. Electric current in electronic devices flows through _____.
8. Components of controlling parts in electronic devices can _____.

Exercise 3. Answer the questions.

1. What is electromagnetism a combination of?

2. How can be electric current produced with the help of magnetism?
3. How do atoms behave in unmagnetized iron and steel?
4. Where can be electronics applied?
5. What are diodes and transistors for in electronic devices?

Read and translate the text.

Atomic energy

A man trying to see a single atom is like a man trying to see a single drop of water in the sea while he is flying high above it. He will see the sea made up of a great many drops of water, but he certainly will not be able to see a single drop. By the way, there are so many atoms in the drop of water that if one could count one atom a second, day and night, it would take one hundred milliard years. But that is certainly impossible.

Man has, however, learned the secret of the atom. He has leafed to split atoms to get great quantities of energy. At present, coal is one of the most important fuel and our basic source of energy. It is quite possible that some day coal and other fuel may be replaced by atomic energy. Atomic energy replacing the present sources of energy, the latter will find various new applications.

The nuclear reactor is one of the most reliable "furnaces" producing atomic energy. Being used to produce energy, the reactor produces it in the form of heat. In other words, atoms splitting in the reactor, heat is developed. Gas, water, melted metals, and some other liquids circulating through the reactor carry that heat away. The heat may be carried to pipes of the steam generator containing water. The resulting steam drives a turbine, the turbine in its turn driving an electric generator. So, we see that a nuclear power-station is like any other power-station but the familiar coal-burning furnace is replaced by a nuclear one, that is the reactor supplies energy to the turbines. By the way, a ton of uranium (nuclear fuel) can give us as much energy as 2.5 to 3 million tons of coal.

The first industrial nuclear power-station in the world was constructed in Obninsk not far from Moscow in 1954. It is of high capacity and has already been working for many years. One may mention here that the station in question was put into operation two years earlier than the British one and three and a half years earlier than the American nuclear power-stations.

Several nuclear power-stations have been put into operation since 1954. The Beloyarskaya nuclear power-station named after academician Kurchatov may serve as an example of the peaceful use of atomic energy in the USSR.

Soviet scientists and engineers achieved a nuclear superheating of steam directly in the reactor itself before steam is carried into the turbine. It is certainly an important contribution to nuclear engineering achieved for the first time in the world.

We might mention here another important achievement, that is, the first nuclear installation where thermal energy generated in the reactor is transformed directly into electrical energy.

Speaking of the peaceful use of atomic energy it is also necessary to mention our nuclear icebreakers "Lenin" is the world's first icebreaker with a nuclear installation. Its machine installation is of a steam turbine type, the steam being produced by three reactors and six steam generators. This icebreaker was followed by many others.

The importance of atomic energy will grow still more when fast neutron reactors are used on a large scale. These reactors can produce much more secondary nuclear fuel than the fuel they consume.

Vocabulary.

Atom – the smallest particle of a chemical element that can exist (атом, мельчайшая частица).

Drop – a small round or pear-shaped portion of liquid that hangs or falls or adheres to a surface (капля).

Furnace – an enclosed structure in which material can be heated to very high temperatures (печь).

Icebreaker – a ship designed for breaking a channel through ice (ледокол).

Installation – a large piece of equipment installed for use (установка, оборудование, монтаж).

Neutron – a subatomic particle of about the same mass as a proton but without an electric charge, present in all atomic nuclei except those of ordinary hydrogen (нейтрон).

Nuclear – denoting, relating to, or powered by the energy released in nuclear fission or fusion (атомный, ядерный).

Power-station – an installation where electrical power is generated for distribution (электростанция).

Reactor – an apparatus or structure in which fissile material can be made to undergo a controlled, self-sustaining nuclear reaction with the consequent release of energy (реактор).

Split – break or cause to break forcibly into parts, especially into halves or along the grain (расколоть, расщепление).

Turbine – a machine for producing continuous power in which a wheel or rotor, typically fitted with vanes, is made to revolve by a fast-moving flow of water, steam, gas, air, or other fluid (турбина).

Exercise 1. Translate the following sentences paying attention to the Participle.

1. Working at his new device, the inventor made numerous experiments.
2. We have been speaking about the peaceful use of atomic energy.

3. In future the nuclear reactor must be one of the most reliable "furnaces" producing atomic energy.

4. Atomic energy being developed in a reactor in the form of heat, we can get both heat and electrical energy.

5. The construction of power-stations operating on atomic fuel and generating electric current is quite necessary.

6. Being a source of heat and electrical energy, atomic energy can also serve us in medicine.

7. The energy sources of the world decreasing, it is necessary to turn to atomic energy.

8. Water falling from its raised position changes potential energy into kinetic energy.

Exercise 2. Answer the questions.

1. Is it possible to see a single atom?
2. Do people use atomic energy nowadays?
3. How do they use atomic energy?
4. What is a nuclear reactor?
5. When was the first world nuclear power-station constructed?
6. What do you know about icebreakers?

Exercise 3. Arrange the words given in A and B in pairs of antonyms.

A. 1. possible; 2. useful; 3. to construct; 4. present; 5. largest; 6. unlimited; 7. to increase; 8. to lose.

B. 1. past; 2. impossible; 3. to find; 4- useless; 5. limited; 6. smallest; 7. to destroy; 8. to decrease.

Read and translate the text.

Lightning

The lightning flash is certainly the earliest manifestation of electricity known to man, although for a long time nobody knew that lightning and atmospheric electricity are one and the same thing. Indeed, for thousands of years people knew nothing about thunderstorms. However, they saw long sparks falling from the dark sky and heard thunder. They knew that these sparks could kill people or strike their houses and destroy them. Trying to understand that dangerous phenomenon, they imagined things and invented numerous stories.

Take the early Scandinavians as an example! They thought that thunderstorms were produced by Thor, the god of thunder. Besides his throwing both thunder and lightning at some people, he was a hammer-thrower. According to the story, his powerful hammer had the property of always coming back to his hands after it had been thrown. The fifth day of the week, that is Thursday, was

named after him. A story like that invented by those early Scandinavians could be also heard from other peoples.

However, time flies. Thunderstorms have long stopped being a problem that scientists tried to solve. Now everybody knows that lightning is a very great flash of light resulting from a discharge of atmospheric electricity either between a charged cloud and the earth or between charged clouds.

Even now some people do not like being out during a thunderstorm. Dark clouds cover the sky, turning day into night. There are lightning flashes followed by thunder which can be heard for kilometers around. There is always some danger in a thunderstorm for a very high building or a man standing in the open field.

Many years ago, people learned to protect their houses from thunderstorms. Coming down from a charged cloud to the earth, lightning usually strikes the nearest conductor. Therefore, it is necessary to provide an easy path along which electrons are conducted to the earth. That Benjamin Franklin invented the lightning conductor is a well-known fact. The lightning conductor, familiar to everybody at present, is a metal device protecting buildings from strokes of lightning by conducting the electrical charges to the earth.

Franklin's achievements in the field of electricity were known to Lomonosov who, in his turn, made experiments of his own. Along with other scientific problems that Lomonosov studied was that of atmospheric electricity. Both Lomonosov and his friend Professor Rihman took great interest in it. Both tried to solve the problem in question. They made numerous experiments and observations without thinking of the possible danger. The first electrical measuring device in the world was constructed by Rihman. Making experiments of that kind was dangerous and Professor Rihman was killed by a stroke of lightning while he was making one of his experiments.

Vocabulary.

Discharge – (Physics) the release of electricity from a charged object (разряд).

Electricity – a form of energy resulting from the existence of charged particles (such as electrons or protons), either statically as an accumulation of charge or dynamically as current (электричество).

Hammer – a tool with a heavy metal head mounted at right angles at the end of a handle, used for jobs such as breaking things and driving in nails (молоток).

Lightning – the occurrence of a natural electrical discharge of very short duration and high voltage between a cloud and the ground or within a cloud, accompanied by a bright flash and typically also thunder (молния).

Spark – a small fiery particle thrown off from a fire, alight in ashes, or produced by striking together two hard surfaces such as stone or metal (искра).

Thunderstorm – a storm with thunder and lightning and typically also heavy rain or hail (гроза).

Exercise 1. Translate the following sentences using the Gerund.

1. Использование новых материалов способствует дальнейшему техническому прогрессу.
2. При объяснении физического явления преподаватель сделал несколько опытов.
3. Увеличение производства энергии необходимо.
4. Изобретатель был против изменения конструкции этого устройства.
5. Увидев прибор в действии, студенты решили, что он надежен.
6. Мы закончили обсуждать эту проблему к концу недели.

Exercise 2. Answer the questions.

1. What is the earliest manifestation of electricity known to man?
2. Are lightning and atmospheric electricity one and the same thing?
3. What did people think about lightning and thunderstorm?
4. What stories did they imagine?
5. How did people learn to protect their houses from thunderstorms?
6. Who invented the lightning conductor?

Read and translate the text.

Atmospheric electricity

Electricity plays such an important part in modern life that to get it, men have been burning millions of tons of coal. Coal is burned instead of its being mainly used as a source of valuable chemical substances which it contains.

Therefore, finding new sources of electric energy is a most important problem that scientists and engineers try to solve." In this connection one might ask: "Is it possible to develop methods of harnessing lightning?" In other words, could atmospheric electricity be transformed into useful energy?

Indeed, hundreds of millions of volts are required for a lightning spark about one and a half kilometer long. However, this does not represent very much energy because of the intervals between single thunderstorms. As for the power spent in producing lightning flashes all over the world, it is only about l/10,000 of the power got by mankind from the sun, both in the form of light and that of heat. Thus, the source in question may interest only the scientists of the future.

It has already been mentioned that atmospheric electricity is the earliest manifestation of electricity known to man. However, nobody understood that phenomenon and its properties until Benjamin Franklin made his kite experiment. On studying the Leyden jar (for long years the only known condenser), Franklin began thinking that lightning was a strong spark of electricity. He began experimenting to draw electricity from the clouds to the earth. The story about his famous kite is known all over the world.

On a stormy day Franklin and his son went into the country taking with them some necessary things such as: a kite with a long string, a key and so on. The key was connected to the lower end of the string. “If lightning is the same as electricity," Franklin thought, "then some of its sparks must come down the kite string to the key." Soon the kite was flying high among the clouds where lightning flashed. However, the kite having been raised, some time passed before there was any proof of its being electrified. Then the rain fell and wetted the string. The wet string conducted the electricity from the clouds down the string to the key. Franklin and his son both saw electric sparks which grew bigger and stronger. Thus, it was proved that lightning is a discharge of electricity like that got from the batteries of Leyden jars.

Trying to develop a method of protecting buildings during thunderstorms, Franklin continued studying that problem and invented the lightning conductor. He wrote necessary instructions for the installation of his invention, the principle of his lightning conductor being in use until now. Thus, protecting buildings from strokes of lightning was the first discovery in the field of electricity employed for the good of mankind.

Exercises 1. Translate the following sentences with Gerund constructions.

1.We did not know about his being sent to the power-station.

2. I remember my having told her about the experiment.

3. His having asked such a question shows that he did not prepare the text.

4. We know of different experiments being made in this laboratory.

5. Your having been sent to Leningrad was known to everybody.

6. Everybody knows about your having worked at the nuclear power plant.

7. The professor knew about the students' going to the power-station.

8. The students read about the new achievements having been made in the field of nuclear physics.

9. Thanks to the lightning conductor having been invented, it is possible to protect buildings from strokes of lightning.

Exercise 2. Answer the questions.

1. Do people try to find new sources of electric energy?
2. Why is it so important?
3. Is it possible to develop methods of harnessing lightning?
4. What is the story about Franklin’s famous kite?
5. Name discovery in the field of electricity that was good for mankind.

Exercise 3. Find the Russian equivalents in the second (b) part of this exercise.

a) 1. to connect; 2. scientific; 3. because of; 4. charge; 5. power; 6. to destroy; 7. to protect; 8. phenomenon; 9. to name after; 10. to develop; 11.

observation; 12. discovery; 13. property; 14. to electrify; 15. substance; 16. to solve a problem.

b) 1. называть в честь; 2. вещество; 3. защищать; 4. свойство; 5. научный; 6. наблюдение; 7. решать проблему; 8. из-за; 9. открытие; 10. соединять; 11. сила, энергия; 12. заряд; 13. явление; 14. разрушать; 15. разрабатывать; 16. Электризовать

Exercise 4. Find the end of the sentence. Try to make as many sentences as possible.

I	II
1. The generator	1. measures the temperature of hot melted metals.
2. The lightning conductor	2. lifts objects weighing thousands of tons.
3. The motor	3. turns electrical energy into mechanical energy.
4. The electric crane	4. protects buildings from lightning strokes.
5. The pyrometer	5. converts mechanical energy into electrical energy.

Read and translate the text.

Electric current

Ever since Volta first produced a source of continuous current, men of science have been forming theories on this subject. For some time, they could see no real difference between the newly discovered phenomenon and the former understanding of static charges. Then the famous French scientist Ampere (after whom the unit of current was named) determined the difference between the current and the static charges. In addition to it, Ampere gave the current direction: he supposed the current to flow from the positive pole of the source round the circuit and back again to the negative pole.

We consider Ampere to be right in his first statement, but he was certainly wrong in the second, as to the direction of the current. The student is certain to remember that the flow of current is in a direction opposite to what he thought.

Let us turn our attention now to the electric current itself. The current which flow along wires consists of moving electrons. What can we say about the electron? We know the electron to be a minute particle having an electric charge. We also know that that charge is negative. As these minute charges travel along a wire, that wire is said to carry an electric current.

In addition to travelling through solids, however, the electric current can flow through liquids as well and even through gases. In both cases it produces some most important effects to meet industrial requirements.

Some liquids, such as melted metals for example, conduct current without any change to themselves. Others, called electrolytes, are found to change greatly when the current passes through them.

When the electrons flow in one direction only, the current is known to be DC, that is, direct current. The simplest source of power for the direct current is a battery, for a battery pushes the electrons in the same direction all the time (i.e., from the negatively charged terminal to the positively charged terminal).

The letters AC stand for alternating current: The current under consideration-flows first in one direction and then in the opposite one. The AC used for power and lighting purposes is assumed to go through 50 cycles in one second. One of the great advantages of AC is the ease with which power at low voltage can be changed into an almost similar amount of power at high voltage and vice versa. Hence, on the one hand alternating voltage is increased when it is necessary for long-distance transmission and, on the other hand, one can decrease it to meet industrial requirements as well as to operate various devices at home.

Although there are numerous cases when DC is required, at least 90 per cent of electrical energy to be generated at present is AC In fact, it finds wide application for lighting, heating, industrial, and some other purposes.

One cannot help mentioning here that Yablochkov, Russian scientist and inventor, was the first to apply AC in practice.

Vocabulary.

Electrolyte – a liquid or gel which contains ions and can be decomposed by electrolysis, e.g., that present in a battery (электролит).

Melt – make or become liquefied by heating (плавиться).

Solid – a substance or object that is solid rather than liquid or fluid (твердое вещество).

Static electricity – a stationary electric charge, typically produced by friction, which causes sparks or crackling or the attraction of dust or hair (статическое электричество).

Exercise 1. Form at least several sentences combining the two columns.

1. The electric current is	1. the energy of position.
2. Kinetic energy is	2. electricity at rest.
3. Static electricity is	3. the flow of moving electrons.
4. Potential energy is	4. the energy of motion.
5. The direct current is	5. a discharge of electricity.
6. Lightning is	6. the flow of electrons in one direction.

Exercise 2. Answer the questions.

1. Who first produced a source of continuous current?
2. Who determined the difference between the current and the static charges?
3. Where was Ampere mistaken?
4. What can we say about the electron?
5. What is DC?

6. What is the simplest source of power for the direct current?
7. What is AC?
8. Who was the first to apply AC in practice?

Read and translate the text.

Electric circuit

The electric circuit is the subject to be dealt with in the present article. But what does the above term really mean? We know the circuit to be a complete path which carries the current from the source of supply to the load and then carries it again from the load back to the source.

The purpose of the electrical source is to produce the necessary electromotive force required for the flow of current through the circuit.

The path along which the electrons travel must be complete otherwise no electric power can be supplied from the source to the load. Thus, we close the circuit when we switch on our electric lamp.

If the circuit is broken or, as we generally say "opened" anywhere, the current is known to stop everywhere. Hence, we break the circuit when we switch off our electrical devices. The current may pass through solid conductors, liquids, gases, vacuum, or any combination of these. It may flow in turn over transmission lines from the power-stations through transformers, cables, and switches, through lamps, heaters motors and so on.

There are various kinds of electric circuits such as: open circuits, closed circuits, series circuits, parallel circuits and short circuits.

To understand the difference between the following circuit connections is not difficult at all. When electrical devices are connected so that the current flows from one device to another, they are said to be connected in series. Under such conditions the current flow is the same in all parts of the circuit, as there is only a single path along which it may flow. The electrical bell circuit is a typical example of a series circuit. The parallel circuit provides two or more paths for the passage of current. The circuit is divided in such a way that part of the current flows through one path, and part through another. The lamps in your room and your house are generally connected in parallel.

Now we shall turn our attention to the short circuit sometimes called "the short". The short circuit is produced when the current is allowed to return to the source of supply without control and without doing the work that we want it to do. The short circuit often results from cable fault or wire fault. Under certain conditions, the short may cause. If the current flow is too great a fuse is to be used as a safety device to stop the current flow.

The fuse must be placed in every circuit where there is a danger of overloading the line. Then all the current to be sent will pass through the fuse.

When a short circuit or an overload causes more current to flow than the carrying capacity of the wire, the wire becomes hot and sets fire to the insulation. If the flow of current is greater than the carrying capacity of the fuse, the fuse melts and opens the circuit.

Vocabulary.

Current – a flow of electricity which results from the ordered directional movement of electrically charged particles (ток).

Electric circuit – a complete and closed path around which a circulating electric current can flow (электрическая цепь).

Electromotive force – (Physics) a difference in potential that tends to give rise to an electric current (электродвижущая сила).

Load – the amount of electricity supplied by a generating system at any given time (нагрузка).

Supply – the action of providing what is needed or wanted (подача, снабжение).

Exercise 1. Answer the questions.

1. What is electric current?
2. What is the purpose of the electrical source?
3. What kinds of electric circuits do you know?
4. Try to describe all of them.

Read and translate the text.

Electricity may be dangerous

Many people have had strong shocks from the electric wires in a house. The wires seldom carry current at a higher voltage than 220, and a person who touches a bare wire or terminal may suffer no harm if the skin is dry. But if the hand is wet, he may be killed. Water is known to be a good conductor of electricity and provides an easy path for the current from the wire to the body. One of the main wires carrying the current, is connected to earth, and if a person touches the other one with a wet hand, a heavy current will flow through his body to earth and so to the other wire. The body forms part of an electric circuit.

When we are dealing with wires and fuses carrying an electric current, it is best to wear rubber gloves. Rubber is a good insulator and will not let the current pass to the skin. If no rubber gloves can be found in the house, dry cloth gloves are better than nothing. Never touch a bare wire with the wet hand, and never, in any situation, touch a water pipe and an electric wire at the same time.

We all use electricity in our homes every day but sometimes forget that it is a form of power and may be dangerous. At the other end of the wire there are great

generators driven by turbines turning at high speed. One should remember that the power they generate is enormous. It can burn and kill, but it will serve us well if we use it wisely.

Exercise 1. Find the statements with mistakes and correct them.

1. The wires carrying the current are connected to earth.
2. Water provides a path for the current to flow.
3. The electric power can serve us well if it is used wisely.

Exercise 2. Answer the questions.

1. Why the electric wires are dangerous for people?
2. Should you touch the wire if your hand is wet?
3. In what cases do people need to wear rubber gloves?
4. What should every person remember concerning wires?

Exercise 3. Which of the sentences contain information from the text?

1. The path along which the electrons travel must be complete.
2. The short circuit often results from cable fault or wire fault.
3. We must always remember that electricity can be dangerous and one should use it carefully.

Read and translate the text.

Electric current serves us in a thousand ways

The electric current was born in the year 1800 when Volta constructed the first source of continuous current. Since that time numerous scientists and inventors, Russian and foreign, have greatly contributed to its development and practical application.

As a result, we cannot imagine modern civilization without the electric current. We cannot imagine how people could do without electric lamps, without vacuum cleaners, refrigerators, washing machines and other electrically operated devices that are used today. In fact, telephones, lifts, electric trams, and trains, radio and television have been made possible only owing to the electric current.

Some people are more familiar with the varies applications of the electric current in their everyday life than they are with its numerous industrial applications. However, electric energy finds its most important use in industry. Take, for example, the electric motor transforming electric energy into mechanical energy. It finds wide application at every plant and factory. As for the electric crane, it can easily lift objects weighing hundreds of tons.

A good example which is illustrating an important industrial use of the electric current is the electrically heated furnace. Great masses of metal melted in such furnaces flow like water. Speaking of the melted metals, we might mention

one more device using electricity, that is the electric pyrometer. The temperature of hot flowing metals can be easily measured owing to the electric pyrometer.

These are only some of the various industrial applications of the electric current serving us in a thousand ways.

Exercise 1. Translate the following sentences.

1. Speaking of the electrically operated devices, one can mention the refrigerator.
2. Having mentioned the name of Volta, the teacher spoke about his invention.
3. The first source of continuous current constructed by Volta appeared in 1800.
4. The temperature of hot flowing metals is often measured by the electric pyrometer.
5. The pyrometer used in industry is a device measuring temperature.
6. The pyrometer showing the temperature of metals melted in furnaces is also an electrical device.
7. Making this instrument, we could not do without a machine operated by electricity.
8. Going along the streets, one can see running trams, trolleybuses, buses, and cars.
9. Being widely used in industry, electrical motors are also used in every home.
10. The problem solved helped to increase the speed of the train.

Exercise 2. Answer the questions.

1. Who constructed the first source of continuous current and when?
2. Can we imagine modern civilization without the electric current? Why?
3. Do all people know about industrial applications of electric current?
4. Give examples of important industrial use of the electric current.
5. Do you know any more modern applications?

Exercise 3. Translate the following sentences using the Participle.

1. Электрический мотор, преобразующий электрическую энергию в механическую, используется в повседневной жизни.
2. Говоря об электрическом токе, мы можем упомянуть имя Вольта.
3. Оптический пирометр измеряет температуру расплавленных металлов.
4. Поработав на фабрике, мой товарищ поступил в институт.
5. Электрические приборы, упомянутые в этой статье, были созданы известными учеными.
6. Измеряя температуру горячих металлов, студент пользовался пирометром.

7. Измерив температуру металла, мы начали измерять температуру воды.

Exercise 4. Give short answers to the following questions.

1. Does the motor find wide application in industry?
2. Is Volta a Russian scientist?
3. Does your friend go to the institute on foot?
4. Is there an electric lamp on your table?
5. Are there many trolleybuses and trams in Almaty?
6. Do you watch television every day?
7. Do you use electrical devices?
8. Can you do without electricity?
9. Does the electric current play an important part in our life?
10. Does the electric motor transform electrical energy into mechanical energy?
11. Is the electric current necessary for the operation of trolley-buses and trams?
12. Is your house heated by an electric furnace?

Read and translate the text.

Light

The form of energy that illuminates our world is called light. It usually comes from hot objects, like the sun or fire, but it is also produced by electricity and some chemical reactions. Light is the only part of the electromagnetic spectrum (which includes microwaves, ultraviolet rays, and X-rays) that is visible to the human eye. It travels at 186,000 miles (300,000 km) per second, and nothing can travel faster. Like other forms of energy, light travels in waves, but it can also travel in packets of energy called quanta. This enables it to travel through a vacuum.

Quantum Theory explains the behavior of light and other forms of energy in the electromagnetic spectrum. Quantum theory explains how light behaves in some ways like waves, and in other ways like streams of particles, which are in fact packets of energy called a quantum (one packet is called a quantum). There are three instances, shown when light can be explained only in terms of quanta.

The word laser stands for «Light Amplification by Stimulated Emission of Radiation». A laser is a device for converting ordinary light into and intense narrow beam. The laser passes an electric current through a material, which can be a solid, liquid, or gas. Some atoms of the material take in energy and give off quanta (packets of radiation). This causes other atoms to give off quanta. These bounce back and forth between mirrors and are fired out as light of a single wavelength.

Rays of light, like all forms of energy that travel in waves, can be reflected. Light rays are reflected when they hit a shiny or silvered surface, such as a still pool of water or a mirror. Reflection involves two light rays: the incoming and the reflected, or outgoing, ray, which bounces off the reflecting surface. The two rays are at identical angles to the reflecting surface on either side of an imaginary line.

Refraction is a property of all types of energy that travel in waves, including light. Light waves normally travel in straight lines, but when they pass from one transparent material to another, they usually refract, or bend. Refraction occurs because light travels at different speeds in different materials. As light from a material with a low density, such as air, enters a material with a high density, such as water, its speed is reduced. This causes it to bend (except when it enters a material at a right angle).

The three primary colors of light are red, green, and blue. When you mix one primary color equally with another, a secondary color is formed. When you mix all three primary colors, you get white light. The way different colors of light combine are known as the additive process.

Vocabulary.

Bend – to (cause to) curve (сгибать, изгиб).

Electromagnetic spectrum – электромагнитный спектр

Quanta – квант, количество

Outgoing – исходящий

Packets of radiation – пакеты радиации

Refraction – when water or glass, etc. refracts light or sound, etc., it causes it to change direction or to separate when it travels through it (преломление).

Vacuum – a space from which most or all the air, gas or other material has been removed or is not present; lack of something (вакуум, пустота).

Exercise 1. Find the end of the sentence.

1. Light is the form of energy that _____.
2. It usually comes from _____.
3. Light travels at a speed of _____.
4. It travels in _____.
5. Quanta are_____.
6. Travelling of light in quanta enables it _____.
7. Quantum theory explains _____.
8. The word laser means (stands for) _____.
9. Laser can pass _____.
10. Light rays are reflected when _____.
11. Refraction is a property of _____.
12. Refraction occurs because _____.
13. Red, green, blue colors are _____.
14. The way different colors of light combine is known as _____.

Exercise 2. Answer the questions.

1. What form of energy is light?
2. What light rays are visible to human eye?
3. What is laser as a device used for?
4. How do atoms of the material behave when laser passes through them?
5. What rays does reflection involve?
6. What happens to light waves when they pass from one transparent material to another?
7. When can the speed of light be reduced?
8. When don’t light rays bend?
9. What occurs when you mix one primary color equally with another?
10. How can be got white light?

Exercise 3. Match the words of the same meaning.

A	B
1. Come from	A. Прозрачный
2. Enable	B. Основной
3. Stream	C. Сгибаться
4. Beam	D. Плотность
5. Packet	E. Забирать
6. Visible	F. Поток
7. Angle	G. Исходить
8. Ordinary	H. Вторичный
9. Pass	I. Преломление
10. Secondary	J. Отскакивать
11. Give off	KДать возможность
12. Take in	L. Угол
13. Bounce	M. Частица
14. Refraction	N. Обычный
15. Density	O. Пучок
16. Cause	P. Излучать
17. Transparent	Q. Проходить
18. Bend	R. Видимый
19. Primary	S. Луч
20. Particle	T. Вызывать

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Erzhanova Zhanna Borisovna

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