

МІНІСТЕРСТВО ОСВІТИ І НАУКИ, МОЛОДІ ТА СПОРТУ УКРАЇНИ
ХАРКІВСЬКА НАЦІОНАЛЬНА АКАДЕМІЯ
МІСЬКОГО ГОСПОДАРСТВА

МЕТОДИЧНІ ВКАЗІВКИ
З ДИСЦИПЛІНИ

“ІНОЗЕМНА МОВА (ЗА ПРОФЕСІЙНИМ СПРЯМУВАННЯМ)”
(АНГЛІЙСЬКА МОВА)

*(з практичної роботи для студентів 1-2 курсів
заочної форми навчання
напряму підготовки 6.050702 «Електромеханіка»)*

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INTRODUCTION

These tests are compiled to provide essential practice for correspondent students who do not have a basic knowledge of English and specializing in **Electrical Engineering**.

These tasks are to change the attitudes of both teachers and students to correspondent course of study. The teacher who is worried that students will be missing something important will find included in the activities which develop intensive and extensive reading skills, writing. The teacher who brings these tasks into the study is not depriving the students of language practice, but is, instead, providing a richer context for such practice.

When teachers use texts for reading they are often too concerned with what was written at the expense of how. Reading in any language is an affective as well as a cognitive process. The teacher's role is not that of corrector or judge, but rather that of enabler. The teacher assists with language, errors, but should not replace the student's perceptions with his or her own.

Each unit contains the following:

- Enlisted grammar material
- exercises
- the text followed by a number of questions about it.

Контрольне завдання №1.

Варіант 1.

Граматика:

1. Порядок слів у реченні. (Word order)
2. Іменник (Nouns). Однина та множина. (Singularity and Plurality)
3. Артикль (The Indefinite article). Нульовий артикль (Zero article)
4. Прийменник (Prepositions).
5. Дієслово (Verb). Дієслова to be, to have. Особові та неособові форми дієслів (Personal non-personal verbs). Перехідні та неперехідні дієслова (Transient and intransient verbs). Самостійні та допоміжні дієслова (Independent and auxiliary verbs). Модальні дієслова (Modal verbs – can, may, must, will, to be). Дієслова-зв'язки. Спосіб дієслів (Mood). Стан дієслів (Voice) – Active and Passive Voice. Вид та число дієслів (Person and number). Час дієслів – Теперішній невизначений час (Present Indefinite/Simple Tense) та Майбутній невизначений час (Future Indefinite/Simple Tense).

Завдання:

1. Перекладіть та поставте в усіх реченнях правильні граматичні форми:

1. Steel _____ largely used for structural purpose. (to be)
2. Heat _____ the energy of the movement of molecules. (to be)
3. A complete vibration or oscillation _____ a round trip, say from "a" to "b" and back to "a". (to mean)
4. A body _____ under the action of some force. (to move)
5. A force _____ 1) magnitude, 2) direction and 3) place of application. These _____ three attributes of a force. (to have, to be)
6. Some bodies _____ a motion of vibration or oscillation. (to have)
7. One _____ as much data on neutron characteristics as possible. (to need)
8. Almost all metals _____ electricity. (to conduct)

2. Перекладіть та поясніть усі граматичні явища у реченні:

1. What is strain caused by?
2. Forces are vector quantities.
3. Valves are usually tested before installation.
5. A liquid hasn't any shape of its own.
6. By motion is here meant quantity of motion.
7. Glass conducts so little current that it is hardly measurable.
8. How do atoms arrange themselves in a liquid.

3. Перекладіть та поясніть усі граматичні явища у реченні:

1. As soon as the shell is shot from the gun it must overcome the resistance of the air.
2. How can the motion be explained?
3. We can actually begin the experiment.

4. Перекладіть та поясніть усі граматичні явища у реченні:

1. My drill wants sharpening.
2. We know the atomic weight of a hydrogen atom to be 1.008.
3. We know a vector quantity to be represented by means of a straight line.
4. We know of the earth behaving as a large magnet.
5. The beta-rays are known to move with high velocity.

5. Перекладіть текст:

Electricians

Electricians install and maintain all of the electrical and power systems for our homes, businesses, and factories. They install and maintain the wiring and control equipment through which electricity flows. They also install and maintain electrical equipment and machines in factories and a wide range of other businesses.

Electricians generally focus on either construction or maintenance, although many do both. Electricians specializing in construction primarily install wiring systems into factories, businesses, and new homes. Electricians specializing in maintenance fix and upgrade existing electrical systems and repair electrical equipment. All electricians must follow State and local building codes and the National Electrical Code when performing their work.

Electricians usually start their work by reading blueprints technical diagrams that show the locations of circuits, outlets, load centers, panel boards, and other equipment. After determining where all the wires and components will go, electricians install and connect the wires to circuit breakers, transformers, outlets, or other components and systems.

When installing wiring, electricians use hand-tools such as conduit benders, screwdrivers, pliers, knives, hacksaws, and wire strippers, as well as power tools such as drills and saws. Later, they use ammeters, ohmmeters, voltmeters, harmonics testers, and other equipment to test connections and ensure the compatibility and safety of components.

Electricians in industrial settings may have periodic extended overtime during scheduled maintenance or retooling periods. Companies that operate 24 hours a day may employ three shifts of electricians.

Maintenance electricians repair or replace electric and electronic equipment when it breaks. They make needed repairs as quickly as possible in order to minimize inconvenience. They may replace items such as circuit breakers, fuses, switches, electrical and electronic components, or wire. Electricians also periodically inspect all equipment to ensure that it is operating properly and to correct problems before breakdowns occur.

Maintenance work varies greatly, depending on where an electrician works. Electricians who focus on residential work perform a wide variety of electrical work for homeowners. They may rewire a home and replace an old fuse box with a new circuit breaker box to accommodate additional appliances, or they may install new lighting and other electric household items, such as ceiling fans. These electricians also might do some construction and installation work.

Electricians in large factories usually do maintenance work that is more complex. These kinds of electricians may repair motors, transformers, generators, and electronic controllers on machine tools and industrial robots. They also advise management as to whether the continued operation of certain equipment could be hazardous. When working with complex electronic devices, they may consult with engineers, engineering technicians, line installers and repairers, or industrial machinery mechanics and maintenance workers.

Work environment. Electricians work indoors and out, at construction sites, in homes, and in businesses or factories. The work may be strenuous at times and may include bending conduit, lifting heavy objects, and standing, stooping, and kneeling for long periods. Electricians risk injury from electrical shock, falls, and cuts, and must follow strict safety procedures to avoid injuries. When working outdoors, they may be subject to inclement weather. Some electricians may have to travel long distances to jobsites.

An electrician prepares the wiring for an interior room.

6. Дайте відповідь на питання:

1. What do electricians install and maintain?
2. What should all electricians follow?

3. What is the work of electricians usually started by?
4. What do electricians use when installing wiring?
5. What may electricians in industrial settings have?

7. Складіть стислий конспект тексту.

Контрольне завдання №1.

Варіант 2

Граматика:

1. Порядок слів у реченні. (Word order)
2. Іменник (Nouns). Однина та множина. (Singularity and Plurality)
3. Артикль (The Indefinite article). Нульовий артикль (Zero article)
4. Прийменник (Prepositions).
5. Дієслово (Verb). Дієслова to be, to have. Особові та неособові форми дієслів (Personal non-personal verbs). Перехідні та неперехідні дієслова (Transient and intransient verbs). Самостійні та допоміжні дієслова (Independent and auxiliary verbs). Модальні дієслова (Modal verbs - can, may, must, will, to be). Дієслова-зв'язки. Спосіб дієслів (Mood). Стан дієслів (Voice) - Active and Passive Voice. Вид та число дієслів (Person and number). Час дієслів – Теперішній невизначений час (Present Indefinite/Simple Tense) та Майбутній невизначений час (Future Indefinite/Simple Tense).

Завдання:

1. Перекладіть та поставте в усіх реченнях правильні граматичні форми:

1. A rectangular _____ a parallelogram having right angles. (to be)
2. Compressing the gas we _____ it into liquid. (shall, to turn)
3. Thermodynamics _____ a science that _____ with energy. (to be, to deal)
4. All molecules _____ the same average energy at any given moment. (to have)

5. Temperature changes _____ nearly all properties of matter. (to affect)
6. The velocity of light _____ 186,300 miles a second. (to be)
7. Bodies _____ under the action of some force. (to move)
8. What form of energy _____ a steam engine? (to produce)

2. Перекладіть та поясніть усі граматичні явища у реченні:

1. Temperature changes affect nearly all properties of matter.
2. Not all metals conduct electricity equally well.
3. The molecules always collide with one another.
4. The number of positive charges in the nucleus is always the same as the number of planetary electrons in the atom.
5. Resonance is often observed in nature.
6. Corrosion of iron causes great economic losses.
7. Stiffness is resistance to deflection or deformation.
8. Air is a conductor when it is ionized.

3. Перекладіть та поясніть усі граматичні явища у реченні:

1. Uranium can be produced from thorium.
2. If we weigh the lamp with the alcohol in it before and after the experiment, we shall be able to determine the amount of alcohol burnt.
3. You have to make numerous computations.

4. Перекладіть та поясніть усі граматичні явища у реченні:

1. Our job will be to investigate some of its properties.
2. Raising the piston allows water to be forced through the valve by the atmospheric pressure.
3. We know gravity to pull on every particle of a body.
4. At least one radioactive isotope is known to exist for all known elements.
5. Hydrogen is the simplest substance, atoms of other elements having a more complex structure.

5. Перекладіть текст:

Insulation Workers

Properly insulated buildings reduce energy consumption by keeping heat in during the winter and out in the summer. Vats, tanks, vessels, boilers, steam and hot-water pipes, and refrigerated storage rooms also are insulated to prevent the wasteful loss of heat or cold and to prevent burns. Insulation also helps to reduce the noise that passes through walls and ceilings. Insulation workers install the materials used to insulate buildings and mechanical equipment.

Insulation workers, apply insulating materials to pipes and ductwork, or other mechanical systems, in order to help control and maintain temperature. When covering a steam pipe, for example, these insulation workers measure and cut sections of insulation to the proper length, stretch it open along a cut that runs the length of the material, and slip it over the pipe. They then fasten the insulation with adhesive, staples, tape, or wire bands. Sometimes, they wrap a cover of aluminum, plastic, or canvas over the insulation and cement or band the cover in place. Finally, mechanical insulation workers may screw on metal around insulated pipes to protect the insulation from the weather or physical abuse.

Insulation workers, floor, ceiling, and wall, apply or blow in insulation in attics and exterior walls. When blowing-in loose-fill insulation, a helper feeds a machine with fiberglass, cellulose, or rock-wool insulation, while another worker blows the insulation with a compressor hose into the space being filled. When covering a wall or other flat surface, these insulation workers may use a hose to spray foam insulation onto a wire mesh that provides a rough surface to which the foam can cling and that adds strength to the finished surface. Workers may then install drywall or apply a final coat of

plaster for a finished appearance. In new construction or on major renovations, insulation workers staple fiberglass or rock-wool batts to exterior walls and ceilings before drywall, paneling, or plaster walls are put in place.

In making major renovations to old buildings or when putting new insulation around pipes and industrial machinery, insulation workers often must first remove the old insulation. In the past, asbestos—now known to cause cancer in humans—was used extensively in walls and ceilings and to cover pipes, boilers, and various industrial equipment. Because of this danger, U.S. Environmental Protection Agency regulations require that asbestos be removed before a building undergoes major renovations or is demolished. When asbestos is present, specially trained workers must remove it before insulation workers can install the new insulating materials. Insulation workers use common hand-tools, including trowels, brushes, knives, scissors, saws, pliers, and stapling guns. They may use power saws to cut insulating materials, welding machines to join metal or secure clamps, and compressors to blow or spray insulation.

Work environment. Insulation workers generally work indoors in residential and industrial settings. They spend most of the workday on their feet, either standing, bending, or kneeling. They also work from ladders or in confined spaces. Their work usually requires more coordination than strength. In industrial settings, these workers often insulate pipes and vessels at temperatures that may cause burns. Minute particles from insulation materials, especially when blown, can irritate the eyes, skin, and respiratory system.

Insulation workers who install insulation on floors, ceilings, and walls experience a high rate of injuries and illnesses. Consequently, workers must follow strict safety guidelines to protect themselves from insulating irritants.

They must keep work areas well ventilated; wear protective suits, masks, and respirators; and take decontamination showers when necessary. Most insulation is applied after buildings are enclosed, so weather conditions have less effect on the employment of insulation workers than some other construction workers.

6. Дайте відповідь на питання:

1. What does insulation help to reduce?
2. What do insulation workers apply to pipes and ductwork to help control and maintain temperature?
3. What do insulation workers measure when covering a steam pipe?
4. What may insulation workers use when covering a wall or other flat surface?
5. What do insulation workers often do in making major renovations to old buildings or when putting new insulation around pipes and industrial machinery?

7. Складіть стислий конспект тексту.

Контрольне завдання №1.

Варіант 3.

Граматика:

1. Порядок слів у реченні. (Word order)
2. Іменник (Nouns). Однина та множина. (Singularity and Plurality)
3. Артикль (The Indefinite article). Нульовий артикль (Zero article)
4. Прийменник (Prepositions).
5. Дієслово (Verb). Дієслова to be, to have. Особові та неособові форми дієслів (Personal non-personal verbs). Перехідні та неперехідні дієслова (Transient and intransient verbs). Самостійні та допоміжні дієслова (Independent and auxiliary verbs). Модальні дієслова (Modal verbs - can,

may, must, will, to be). Дієслова-зв'язки. Спосіб дієслів (Mood). Стан дієслів (Voice) - Active and Passive Voice. Вид та число дієслів (Person and number). Час дієслів – Теперішній невизначений час (Present Indefinite/Simple Tense) та Майбутній невизначений час (Future Indefinite/Simple Tense).

Завдання:

1. Перекладіть та поставте в усіх реченнях правильні граматичні форми:

1. Electromagnetic waves _____ with the velocity of light. (to travel)
2. Shafts _____ with cutters. (to be turned)
3. Forces which _____ positive work _____ sometimes _____ efforts. (to do, to be called)
4. Energy _____ as the ability _____ work. (to be defined, to do)
5. Friction always _____ the motion, whatever its direction. (to oppose)
6. A body at rest _____ at rest unless it _____ upon by an external force. (to remain, to be acted)
7. The deflection of a beam _____ on the material of which the beam _____. (to depend, to be made)
8. As long as the current _____ the armature _____. (to flow, will, to keep rotating)

2. Перекладіть та поясніть усі граматичні явища у реченні:

1. All bodies consist of molecules and these of atoms.
2. Strength, hardness, machine-ability and ductility are mechanical properties of materials.
3. The attractions between gas molecules are very slight ones.
4. The units used are called volts.
5. The normal helium atom has no affinity for other electrons.
6. A force is an action exerted by one body on another.

7. The total number of particles of both kinds (protons and neutrons) is given by the rough atomic weight.
8. The heat treatment consists in our raising the temperatures of the emitter to about 2500° for a brief period.

3. Перекладіть та поясніть усі граматичні явища у реченні:

1. Do you have to do that part of the work in the laboratory?
2. In order that such a change may be possible, heat must be removed from the gas.

4. Перекладіть та поясніть усі граматичні явища у реченні:

1. The melting of copper, iron and cast iron requires a very high temperature.
2. Compressing gas we turn it into liquid.
3. In moving about molecules make repeated collisions with their neighbours.
4. All bodies are known to possess weight.
5. The capacity for doing work a moving body possesses is called the kinetic energy of a given body.

5. Перекладіть текст:

Electric Fish, or "Living" Electricity

In the wild-life there are quite a few processes, related to the electric phenomena. We will consider some of them.

Many flowers and leaves have the ability to be closed and opened up depending on time of the day. It is contingent with the electric impulses, being a potential of the action. It is possible to make leaves to be closed with the external electric irritants. Besides, many plants have currents of damages. Cuts of leaves, stem are always charged with a negative energy in relation to the normal tissue.

If you take a lemon or an apple and cut it, and then attach two electrodes to the peel, they will not expose the difference of potentials. If to attach one electrode to the peel, and the other to the inside of the pulp, the difference of potentials will appear, and a galvanometer will be marked with the occurrence of strength of the current.

Pisces not worse, but at times better than the most sensible devices in the world register the electric field and notice the least change of its tension. Pisces, as it appeared, are not only floating "galvanometers" but also floating "electric generators". They radiate the electric current in the water and produce the electric field around, considerably greater on force, than arising up around the ordinary living cells.

With the electric signals fish can even possess the special feature to "exchange" remarks. Eels, for example, at the sight of food begin to generate the impulses of current of a certain frequency, attracting the colleagues at the same time. And if two fish are placed in one aquarium, the frequency of their electric charges at once is increased.

Pisces live in water. Salt water is a wonderful conductor. Electric waves spread in it, not going out slowly for thousands of kilometres. In addition, fish have physiological features of muscle structure making them "living generators in the course of time".

Pisces-competitors determine the force of their opponent considering the force of the signals radiated by it. Other animals do not have such senses. Why only fish are provided with this property?

In life of different fishes the role of electricity is different. Some of them with the help of the special organs produce powerful electric charges in water. So, for example, a freshwater eel produces a tension of such a strength, that it

can repulse the attack of an enemy or paralyse a victim. The electric organs of fish consist of muscles which lost the capacity for reduction. Muscle tissue serves as a conductor, and connective – as an insulator. The nerves go from a spinal cord to the organs. And on the whole it represents a petty-lamina structure of alternating elements. An eel has from 6000 to 10000 consecutively united elements, forming a column, and about 70 columns in every organ, located along the body.

Many fishes (such as a Nile sheat-fish, a knife-fish) have a head that is charged positively, and a tail – negatively, and as for the electric sheat-fish, vice versa, a tail – positively, and a head – negatively. The electric properties fish use both for attack and protection, and also in order to search for a victim, to orient in a turbid water, to identify dangerous enemies.

There are also slightly-electrified fishes. They do not have any electric organs. These are ordinary kinds of fish: the European carp, the carp, the gudgeons and others. They feel the electric field and radiate a weak electric signal.

6. Дайте відповідь на питання:

1. What are cuts of leaves and stem always charged with?
2. What will happen if to attach one electrode to the peel, and the other to the inside of the pulp?
3. What, as it appeared, are pisces?
4. What do they radiate in the water and produce around?
5. What can fish possess with the electric signals?

7. Складіть стислий конспект тексту.

Контрольне завдання №1.

Варіант 4.

Граматика:

1. Порядок слів у реченні. (Word order)
2. Іменник (Nouns). Однина та множина. (Singularity and Plurality)
3. Артикль (The Indefinite article). Нульовий артикль (Zero article)
4. Прийменник (Prepositions).
5. Дієслово (Verb). Дієслова to be, to have. Особові та неособові форми дієслів (Personal non-personal verbs). Перехідні та неперехідні дієслова (Transient and intransient verbs). Самостійні та допоміжні дієслова (Independent and auxiliary verbs). Модальні дієслова (Modal verbs - can, may, must, will, to be). Дієслова-зв'язки. Спосіб дієслів (Mood). Стан дієслів (Voice) - Active and Passive Voice. Вид та число дієслів (Person and number). Час дієслів – Теперішній невизначений час (Present Indefinite/Simple Tense) та Майбутній невизначений час (Future Indefinite/Simple Tense).

Завдання:

1. Перекладіть та поставте в усіх реченнях правильні граматичні форми:

1. All gases _____ into each other. (to diffuse)
2. If you touch the charged body with your hand, you _____ it with the ground. (will, to connect)
3. The atomic reactor _____ in a jacket of steel. (to be encased)
4. Low-carbon steels _____ as "mild steel". (to be known)
5. When _____ the viscosity of liquids _____? (to decrease)
6. Energy _____ in the same units as work. (to measure)
7. Unlike poles _____ each other and like poles _____ each other. (to attract, to repel)
8. What other forms of motion _____ you _____? (to know)

2. Перекладіть та поясніть усі граматичні явища у реченні:

1. Radar operates at any weather.
2. We shall begin our experiments next week.
3. What are the molecules composed of?
4. A neutron moves at the rate of many miles.
5. All particles of a rotating body describe circles whose centers are in axis.
6. The atoms of a matter are extremely small.
7. A body at rest remains at rest unless acted upon by an external force.
8. Evidently when there are no forces acting on a body, that body is in equilibrium.

3. Перекладіть та поясніть усі граматичні явища у реченні:

1. A force can act through contact or from a distance.
2. The answer may give the key to the whole problem.

4. Перекладіть та поясніть усі граматичні явища у реченні:

1. By our increasing the pressure we increase the force of friction.
2. The elements if arranged according to their atomic weight, exhibit an evident periodicity of properties.
3. Using a transformer it is possible to increase or decrease the voltage of the alternating current.
4. The melting ice or snow keeps the same temperature while melting.
5. It is necessary that alpha-rays be widely used in ionizing gases.

5. Перекладіть текст:

From the history of «metallic» electricity, discovered by Volta.

After discovering the law of energy conservation in physics electric chemists expose Volta's points of view a severe criticism. An electric current cannot flow and the heat cannot be released without any expenses of energy! There

cannot be the electric phenomena only from the touch of two metals; in midair there are always vapours which settle on metals and oxidize them. Volta discovers not «metallic» electricity, but «chemical» electricity, - because in its elements the chemical energy is transformed into electric, that is why zinc oxidizes!

Look, what a remarkable exact reiteration with the story of Galvani!

Galvani actually discovers «metallic» electricity, and thinks that discovers «animal electricity», - Volta remarks. The Galvani's error is that he let to pass on a major fact which conflicts with his theory, that is — the necessity of presence of two different metals (more precisely, he pays attention, but does not give the fact a due value). Volta discovers «chemical» electricity, and thinks that he discovers «metallic» electricity, — V. Ostwald writes in «The history of electric chemistry». Volta does not pay attention to the major fact which conflicts with his theory of a perpetual motion, that is - the oxidization of electrodes, more precisely, he does not give it a due value.

But the most interesting thing is that Galvani is right too, and his critic Volta as well, the same as Volta is right and his critic Ostwald either.

Actually Galvani discovers two different phenomena — «animal electricity» and metallic. But he considers that he discovers only first of them, and Volta considers that exists only the second. Just as Volta discovers two different phenomena — the contact difference of potentials, appearing at the contiguity of two metals and chemical sources of the current. But Volta considers that he discovers the first phenomenon only, while his critic Ostwald acknowledges only the second. (The difficulty to distinguish some phenomena, showing up simultaneously and in similar to some extent experiments, is very typical for science, and we will run to it but once.) The

further process of science shows, that Galvani, Volta and Ostwald are right and are wrong at the same time.

When Volta invents a galvanic element, he faces a question: what is the reason of an origin of the electric current — in contiguity of two metals or in contiguity of metals with liquids?

Volta makes an attempt in general to remove liquids and makes such an experiment. He puts a copper disk on a sensible electroscope, he covers it with the thin layer of an insulator above. He lays the same zinc disk with an insulating pen above it and these two disks for an instant are connected with a copper wire. Then the wire is taken away and the upper disk is taken away. An electroscope shows the presence of a charge. Volta explains this experience so: when two heterogeneous metals are driven to contiguity, they get different charges. But these charges, attracting each other, remain the same for the different sides of an insulator. When the upper charged disk is taken away, the charges from a lower disk get on the petals of the electroscope. And no liquid is there.

Consequently, all the matter is simply in contiguity of two metals! But nothing takes place here with metals, except for the appearance of charge. It means, as asserts Volta, he succeeds in discovering a source of the electric current which can work only from contiguity of metals, not changing and not expending them.

There is only one «little detail»: unfortunately, zinc electrode in galvanic elements for some reason all the time oxidizes and the oxide of zinc interrupts the current flow. Electrodes have to be cleaned. Volta all the time tries to make the galvanic elements of the best structure, but in any way could not get rid of the appearance of oxide. He is sure nevertheless, that in

principle the task is solvable and he makes his dream come true — creates a perpetual motion!

6. Дайте відповідь на питання:

1. What question faces Volta?
2. What does he put on a sensible electroscope?
3. What way does Volta explain the experience?
4. What does Volta discover?
5. What does Galvani actually discover as Volta remarks?

7. Складіть стислий конспект тексту.

Контрольне завдання №1.

Варіант 5.

Граматика:

1. Порядок слів у реченні. (Word order)
2. Іменник (Nouns). Однина та множина.(Singularity and Plurality)
3. Артикль (The Indefinite article). Нульовий артикль (Zero article)
4. Прийменник (Prepositions).
5. Дієслово (Verb). Дієслова to be, to have. Особові та неособові форми дієслів (Personal non-personal verbs). Перехідні та неперехідні дієслова (Transient and intransient verbs). Самостійні та допоміжні дієслова (Independent and auxiliary verbs). Модальні дієслова (Modal verbs - can, may, must, will, to be). Дієслова-зв'язки. Спосіб дієслів (Mood). Стан дієслів (Voice) - Active and Passive Voice. Вид та число дієслів (Person and number). Час дієслів – Теперішній невизначений час (Present Indefinite/Simple Tense) та Майбутній невизначений час (Future Indefinite/Simple Tense).

Завдання:

1. Перекладіть та поставте в усіх реченнях правильні граматичні форми:

1. Two score revolving giants _____ here in one place. (to be mounted)
2. The behavior of gas _____ easily _____, if we remember what it _____. (to be understood, to be)
3. _____ you _____ any laboratory experience? (to have)
4. No flow _____ unless there _____ a difference in pressure. (to occur, to be)
5. What temperature _____ aluminium _____ at? (to melt)
6. A liquid _____ the shape of the containing vessel. (to have)
7. The normal state for a body _____ one of rest or of uniform motion in a straight line. (to be)
8. Heat _____ a form of energy. (to be)

2. Перекладіть та поясніть усі граматичні явища у реченні:

1. The units, used to measure time, space and mass are called fundamental units.
2. The force referred to is called strength.
3. The molecules forming a nail, are we believe in motion.
4. The gamma rays are affected by a magnetic field.
5. A liquid has no shape.
6. The direction of a magnetic field is the direction the North Pole of the compass points in.
7. Two essential parts that a dynamo consists of are the field magnet and the armature.
8. Every machine wastes energy because of friction.

3. Перекладіть та поясніть усі граматичні явища у реченні:

1. You must pull a rubber band as hard with your left hand as you do with your right.
2. When a body can do work it is said to possess energy.
3. A body may be at rest without being in equilibrium.

4. Перекладіть та поясніть усі граматичні явища у реченні:

1. The force referred to is an elastic restoring force.
2. We want tracer atoms, used in all branches of science and technics.
3. Due to friction part of energy developed by mechanical devices is lost in the form of useless heat.
4. To an ordinary observer the air seems to have no weight.
5. The function of a transmitter is to propagate radio waves.

5. Перекладіть текст:

The development of fundamentals of electrodynamics

On discovering the interaction of circular currents, Ampere begins to study the linear currents. For this purpose he constructs the so-called «machine-tool of Ampere» in which one conductor may change the position relatively to the other conductor. It is discovered during these experiments, that two linear currents attract or push away each other depending on whether the kinds of currents have identical direction or different.

The series of these experiments allows Ampere to set the law of the interaction of the linear kinds of current: "Two parallel and identically directed currents nail mutually, while two parallel and opposite directed currents push off mutually". Ampere suggests to name the found out phenomenon "electrodynamic" unlike the electrostatic phenomenon.

Summarizing the results of the experimental works Ampere shows out the mathematical formula for the force of interaction of currents like it is done by Coulon in relation to the interaction of the static charges. Ampere decides this task analytically coming from principles of Newton about the interaction of the masses and becoming similar to these masses two elements of current arbitrarily located in space. Ampere supposes thus that the interaction of the elements of current takes place on a line, connecting the middles of these elements and that it is proportional to the length of elements of electric currents which is published in 1820.

The electrodynamic theory of Ampere is expounded by him in his treatise "Theory of the electrodynamic phenomena" shown exceptionally from experience, published in Paris in 1826-1827. Ampere introduces the well-known mathematical formula of the law of interaction between two elements of current.

Having considered the works of his predecessors and also the important results of his research Ampere comes to the quite new conclusion about the reason of the phenomena of magnetism.

Denying the existence of the special magnetic liquids Ampere asserts that the magnetic field has an electric origin. All the magnetic phenomena are taken by him to the "pure electric actions". Based on the identity of the interaction of the circular currents and magnets Ampere comes to the conclusion that the magnetism of some particle is conditioned with the presence of the circular currents in this particle and the properties of the magnet on the whole are conditioned with the electric currents located in the planes perpendicular to its axis.

Ampere underlines that "...these currents around the axis of the magnet exist in reality or rather that magnetizing is an operation by means of which

the properties are excited with the same electromotive action that is present in the Volta's post in order these currents to begin to react with the particles...The magnetic phenomena are caused exceptionally by electricity... there is no difference between two poles of the magnet as well as in their position in relation to the currents which this magnet consists of."

The hypothesis of the molecular circular currents developed by Ampere is a new progressive step on the way to the materialistic interpretation of the nature of magnetic phenomena.

Ampere in 1820 states the idea about the possibility of invention of the electromagnetic telegraph based on the interaction of the conductor with the current and the magnetic pointer. However Ampere suggests to take "so much conductors and magnetic pointers how many there are letters..., placing every letter on a separate pointer". Obviously that a similar construction of the telegraph will be very bulky and expensive that presumably prevents from practical realization of the suggestion of Ampere. Some time required in order to find more real ways of invention of the telegraph.

1. Дайте відповідь на питання:

1. For what purpose does Ampere construct the so-called «machine-tool of Ampere»?
2. What law does the series of the experiments allow Ampere to set on?
3. What is expounded by Ampere in his treatise "Theory of the electrodynamic phenomena", published in Paris in 1826-1827?
4. What conclusion, based on the identity of the interaction of the circular currents and magnets does Ampere come to?

5. What idea does Ampere state in 1820?

7. Складіть стислий конспект тексту.

Контрольне завдання №2.

Варіант 1.

Граматика:

1. Рід та відмінок іменників. (Gender and Case)
2. Артикль (The Definite article).
3. Займенник (Pronouns). Особові займенники (Personal pronouns). Питальні та відносні займенники (Interrogative and relative pronouns). Невизначені займенники (Indefinite pronouns).
4. Числівник (Numerals).
5. Дієслово (Verb). Дієслова to be, to have. Особові та неособові форми дієслів (Personal non-personal verbs). Правильні та неправильні дієслова (Regular and irregular verbs). Перехідні та неперехідні дієслова (Transient and intransient verbs). Самостійні та допоміжні дієслова (Independent and auxiliary verbs). Модальні дієслова (Modal verbs – should, would). Дієслова-зв'язки. Спосіб дієслів (Mood) - Subjunctive Mood. Стан дієслів (Voice) - Active and Passive Voice. Вид та число дієслів (Person and number). Час дієслів – Минулий невизначений час (Past Indefinite/Simple Tense). Узгодження часу (Sequence of tenses).

Завдання:

1.Перекладіть та поставте в усіх реченнях правильні граматичні форми:

1. Power _____ the rate that mechanical work _____ at. (to be, to be performed)
2. If one _____ a bar magnet, each of two halves _____ a complete magnet. (to halve, to be)
3. All bodies _____ inertia. (to have)

4. Some liquids _____ immiscible, others _____ completely miscible. (to be, to be)
5. Nitrogen _____ . (will, not, to burn)
6. Each substance _____ at a definite temperature. (to melt)
7. In the radio telephone sound waves _____ into radio waves. (to be converted)
8. The water inside the pipe _____ the pressure of the air. (not, to meet)

2. Перекладіть та поясніть усі граматичні явища у реченні:

1. Generally speaking, metals are excellent conductors.
2. Induction is a method of charging a conductor from a charged object which does not require bringing the two into contact.
3. Pieces of paper are attracted by sealing wax rubbed with a cloth.
4. In order to measure the resistance of a conductor it is necessary to have some fixed standard.
5. Who(m) was this law discovered by?
6. We finished our experiment on Monday this week.
7. The earth and other planets move around the sun and at the same time they rotate about their own axes too.

3. Перекладіть та поясніть усі граматичні явища у реченні:

1. Every mechanism has friction.
2. In engineering we have to do with pressure much greater than that of air.
3. It is important that you should know another definition of the radioactive substance.

4. Перекладіть та поясніть усі граматичні явища у реченні:

1. To weld metals is possible by means of heat produced by a current.
2. The drying of materials is effected by a high-frequency current.
3. The energy of a body is its capacity for doing work.

4. We know electrons to travel from the cathode to the anode.

5. Перекладіть текст:

Electric Fish, or "Living" Electricity

The change of a potential of some vegetable tissues in the moment of their destruction was discovered by Indian scientist Bos. In particular, he discovered the external and internal of a pea with a galvanometer. He heated a pea to the temperature of 60C, the electric potential was registered in 0,5 V. This scientist also investigated a ball of mimosa which he irritated with the short impulses of current.

There was a potential of action at an irritation. The reaction of mimosa was not instantaneous, but with a delay of 0,1 s. In addition, the other type of excitation, the so-called wave, appeared at damaging and spread in the conducting ways of mimosa. This wave passes the balls, arriving at a stem, causes the origin of the potential of an action, transmissible along a stem and resulting in lowering of near-by leaves. A mimosa reacts with the motion of a leaf on the irritation of a ball by the current of 0,5 mA. The sensitiveness of a frog of a man in 10 times less.

No less interesting phenomenon, related to the electricity, is possible to discover with fish. Ancient Greeks were to beware of meeting in water the fish which compelled to become freeze animals and people. This fish was an electric ray or skate and was named "torpedo". There are also slightly-electrified fishes. They do not have any electric organs. These are ordinary kinds of fish: the European carp, the carp, the gudgeons and others. They feel the electric field and radiate a weak electric signal.

At first biologists found out the strange conduct of a small freshwater fish – the American sheat-fish. It felt the approaching of a metallic stick to it in the

water in the distance of a few millimetres. English scientist Gans Lissman put metallic objects in a paraffin or glass shell, dropped them into the water, but to deceive the Nile sheat-fish he could not. The fish felt a metal. Indeed, it turns out, that the fish have the special organs which perceive a weak tension of an electric-field.

Checking up the sensitiveness of electric receptors of fish, scientists carried out a test. They closed an aquarium with fish with a dark cloth or paper and led with a small magnet alongside on air. A fish felt the magnetic field. Then researchers simply waved hands near an aquarium. And it reacted even on the weakest bioelectric field, created with a human hand.

The ability of fish to accumulate electric energy, makes them the ideal accumulators. If it was possible to understand the peculiarities of their work in detail, the revolution would happen in the engineering, in the sphere of creation of accumulators. Electric location and underwater connection of fish allowed to develop the system of the off-wire connection between a fishing vessel and a trawl.

It is appropriate to finish with an utterance which was written next to an ordinary glass aquarium with an electric skate, presented on the exhibition of English Scientific Royal Society in 1960. Two electrodes were put in an aquarium, which a voltmeter was connected to. When fish was in a state of a rest, a voltmeter showed 0 V. at motion of fish – 400 Vs. The nature of this electric phenomenon, the man hasn't revealed till nowadays. The secret of the electric phenomena in wild-life still agitates the minds of scientists and requires the decision.

6. Дайте відповідь на питання:

1. What phenomenon did Indian scientist Bos discover?

2. What other phenomena were of his particular interest?
3. What were ancient Greeks beware of meeting in water?
4. What test did scientists carry out?
5. What makes the fish the ideal accumulators?

7. Складіть стислий конспект тексту.

Контрольне завдання №2.

Варіант 2.

Граматика:

1. Рід та відмінок іменників. (Gender and Case)
2. Артикль (The Definite article).
3. Займенник (Pronouns). Особові займенники (Personal pronouns). Питальні та відносні займенники (Interrogative and relative pronouns). Невизначені займенники (Indefinite pronouns).
4. Числівник (Numerals).
5. Дієслово (Verb). Дієслова to be, to have. Особові та неособові форми дієслів (Personal non-personal verbs). Правильні та неправильні дієслова (Regular and irregular verbs). Перехідні та неперехідні дієслова (Transient and intransient verbs). Самостійні та допоміжні дієслова (Independent and auxiliary verbs). Модальні дієслова (Modal verbs – should, would). Дієслова-зв'язки. Спосіб дієслів (Mood) - Subjunctive Mood. Стан дієслів (Voice) - Active and Passive Voice. Вид та число дієслів (Person and number). Час дієслів – Минулий невизначений час (Past Indefinite/Simple Tense). Узгодження часу (Sequence of tenses).

Завдання:

1. Перекладіть та поставте в усіх реченнях правильні граматичні форми:

1. Each substance _____ at a definite temperature. (to melt)

2. In the radio telephone sound waves _____ into radio waves.
(to be converted)
3. The water inside the pipe _____ the pressure of the air.
(not, to meet)
4. A body _____ a motion of translation when it _____ in the same direction.
(to have, to move)
5. The heart of the cyclotron _____ a large round vessel; this _____ a vacuum chamber. (to be, to be)
6. What _____ the physical properties of the material? (to be)
7. Insulators in reality _____ a current, but their resistance _____ very high. (to conduct, to be)
8. Quantities which _____ both magnitude and direction _____ vector quantities. (to have, to be)

2. Перекладіть та поясніть усі граматичні явища у реченні:

1. Gases expand and contract not only when temperature alters but also when the air pressure alters.
2. The energy of water is transformed into electric energy by means of hydraulic turbines.
3. A steam turbine does mechanical work by virtue of steam acting on its blades.
4. The molecules are held together by attractive forces.
5. The experiment was postponed in view of late time.
6. Though there were vacant places in the Periodic Table, Mendeleyev predicted the properties of the missing elements.
7. When two bodies oscillate at the same frequency they are said to be in resonance.

3. Перекладіть та поясніть усі граматичні явища у реченні:

1. A body may be divided into separate tiny particles.
2. A force may act through contact, or it may act from a distance.

3. One cannot see a reactor itself, only its cover.

4. Перекладіть та поясніть усі граматичні явища у реченні:

1. Owing to the frequency of collisions between molecules, their motions are entirely at random.

2. After all the data being obtained the crystal was taken from the oil-bath.

3. The only way to charge a body negatively is to add electrons to it.

4. Gases and liquids return to their original volume as soon as the applied force is removed.

5. Перекладіть текст:

The interaction of the electric current and the magnet.

The expansion and intensification of the electric phenomena researches resulted in discovery and study of the new properties of electric current. In 1820 the experiments of G.H. Oersted on the observation of current influence on a magnetic pointer were published and shown, having provoked a large interest among scientists from different countries and received further intensification and development in their works.

A small (less than 5 pages) brochure by Oersted «Experiments, concerning electric influence conflict on a magnetic pointer» made a sensation in the world among the European physicists.

The conclusion of Oersted that of an «electric conflict» deserves attention (i.e. counter-motion of the positive and negative «electric matter») in the conductor of «...it is not limited with a conducting wire, but has a vast sphere of activity round this wire... This conflict is formed by a whirlwind around the wire».

Obviously, Oersted was mistaken, supposing that the collision of heterogeneous kinds of electricity operates on a magnetic pointer. But about

connection between the electric and magnetic phenomena Oersted offered supposition in one of the works, published «It is necessary to test whether the electricity makes some influence in the hidden stage on a magnet as such» as early as 1812.

Soon after the publication of this brochure (in 1820) German physicist Iogan H. S. Shveygger (1779—1857) suggested to use the aberration of the needle with an electric current for the construction of the first measuring device — the indicator of the current.

His device, got the name of a «multiplicator» (i.e. increasing) and was a magnetic pointer, placed into a scope, consisting of coils of wire. However because of the influence of the earth magnetism on the magnetic pointer of the multiplicator its measures were inexact.

Ampere in 1821 showed the possibility of influence removal of the earth magnetism with the help of the astatic pair, representing two magnetic pointers, fixed on a general copper axis and located parallel to each other, with the poles, turned in the opposite sides.

In 1825 Florentine professor Leopoldo Nobili (1784—1835) combined the astatic pair with the multiplicator and arranged in this way a more sensible device — the prototype of galvanometer.

In 1820 the new phenomenon of magnetizing of a conductor with a flowing in it current was found out by D. F. Arago. If a copper wire, connected with the poles of the Volta's post, was submerged in the ferrous saw-dusts, the latter evenly stuck to it. At the cutting down of the current the saw-dusts fell away. When Arago took instead of a copper wire a ferrous one (from the soft iron), it magnetized temporally. The piece of steel is at such magnetizing a permanent magnet.

On the recommendation of Amper Arago replaced a rectilinear wire with a spiral wire, here magnetizing of a needle, placed to the spiral inwardly, increased. So a solenoid was created. The experiments of Arago first proved the electric nature of magnetism and the magnetizing became possible due to an electric current.

In the process of researches Arago found out (in 1824) another new phenomenon, named by him the «magnetism of rotation» and consisting in the rotation (of a copper) metal-plate, placed above the magnetic pointer (or under it), the last also comes in the rotation. Neither Arago nor Ampere were able to explain this phenomenon. The correct explanation of this phenomenon was given by Faraday only after the discovery of the phenomenon of electromagnetic induction.

A new step in the high-quality control of the action of current on a magnet for the determination of the quantitative dependences was the invention of the law of the action of current on a magnet by French scientists Jean Batista Biot (1774-1862) and Felix Savar (1791-1841).

This law is now well-known it is less known who discovered it.

6. Дайте відповідь на питання:

1. What was published in 1820?
2. What is the conclusion of an «electric conflict» of Oersted that deserves attention?
3. What was the mistake of Oersted?
4. What was the name of a device of German physicist Iogan H. S. Shveygger and what it was in general?

5. What did Florentine professor Leopoldo Nobili combine in 1825?

7. Складіть стислий конспект тексту.

Контрольне завдання №2.

Варіант 3.

Граматика:

1. Рід та відмінок іменників. (Gender and Case)
2. Артикль (The Definite article).
3. Займенник (Pronouns). Особові займенники (Personal pronouns). Питальні та відносні займенники (Interrogative and relative pronouns). Невизначені займенники (Indefinite pronouns).
4. Числівник (Numerals).
5. Дієслово (Verb). Дієслова to be, to have. Особові та неособові форми дієслів (Personal non-personal verbs). Правильні та неправильні дієслова (Regular and irregular verbs). Перехідні та неперехідні дієслова (Transient and intransient verbs). Самостійні та допоміжні дієслова (Independent and auxiliary verbs). Модальні дієслова (Modal verbs – should, would). Дієслова-зв'язки. Спосіб дієслів (Mood) - Subjunctive Mood. Стан дієслів (Voice) - Active and Passive Voice. Вид та число дієслів (Person and number). Час дієслів – Минулий невизначений час (Past Indefinite/Simple Tense). Узгодження часу (Sequence of tenses).

Завдання:

1. Перекладіть та поставте в усіх реченнях правильні граматичні форми:

1. The type of the manometer _____ on the magnitude of pressure _____. (to depend, to be measured)
2. No substance _____ a perfect insulator. (to be)
3. The property by virtue of which a body _____ in either of the natural states _____ inertia. (to tend, to remain, to be called)
4. Bodies _____ lighter in water than they _____ in air. (to be, to be)

5. Heat capacity of alcohol _____ less than that of mercury. (to be)
6. Friction always _____ itself as a force that opposes motion. (to manifest)
7. Newton's Laws of Motion _____ upon his own and Galileo's experiments. (to be based)
8. A small lamp _____ a higher resistance than a large one. (to have)

2. Перекладіть та поясніть усі граматичні явища у реченні:

1. Each atom represents something similar to our solar system.
2. In spite of the fact that there is no chemical union between oxygen and nitrogen, the composition of air is extraordinary constant.
3. In the event of any trouble in the work of the apparatus, take down the voltage.
4. Motion means a change of the position of an object with respect to the position of some other object or objects.
5. The thermometer becomes useless if the fluid in it either freezes or boils.
6. With the increase of pressure the molecules get so close that they repel each other.
7. When was the steam engine invented?
8. B. Franklin was the originator of the theory of atmospheric electricity.

3. Перекладіть та поясніть усі граматичні явища у реченні:

1. That needs explaining.
2. A body can move uniformly and in a straight line, here being no cause to change that motion.
3. A few electrons may readily be removed from, or added to an atom.

4. Перекладіть та поясніть усі граматичні явища у реченні:

1. Any body when heated to a sufficiently high temperature becomes a source of light.
2. Experiments proved heat and other forms of energy to be mutually convertible.

3. Supposing two equal and opposite forces are applied to the body, will it remain in equilibrium?
4. All gases liquefy before reaching absolute zero.

5. Перекладіть текст:

An invention of the Leyden jar - a new page in the chronicles of electricity

Since the division of bodies was set on conductors and non-conductors, and experiments with electrostatic machines got world-wide acknowledgement, it was quite natural that there was an attempt to «accumulate» electric charges in a glass retort which could contain them. Among many physicists, engaged in similar experiments, the most famous was the name of Dutch professor from Leyden of Muskhenbruk (1692—1761).

Knowing that the glass does not conduct electricity, he (in 1745) took a glass jar (retort), filled with water, put a copper wire into it, that was hanging on the conductor of the electric machine, and taking a jar in the right hand, asked the assistant to revolve the ball of the machine. Thus he supposed correctly, that the charges acting from a conductor would accumulate in the glass jar.

Since, according to his opinion, there were enough charges to accumulate in a jar, he decided to disconnect a copper wire with his left hand. Thus, he felt a severe stroke, it seemed to him that it was the end. In a letter to Reomyur to Paris (in 1746) he wrote, that this «new and frightful experiment I wouldn't advise in any way to repeat» and that «even for the sake of the crown of France he will disagree to be exposed to such a terrible concussion».

So the Leyden jar (named after Leyden) was invented, and soon the first simplest condenser, one of the wide-spread electrical engineering devices appeared.

The experience of Muskhenbruk made a real sensation not only among physicists but also among many amateurs, interested in the electric experiments.

Regardless of Muskhenbruk in that 1745 German scientist E.G Kleyst came to the idea of invention of the Leyden jar. Experiments with the Leyden jar began to make physicists of different countries, and in 1746—1747 the first theories of the Leyden jar were developed by famous American scientist B. Franklin and keeper of the physical laboratory Watson in England. It is interesting to note that Watson was overwhelmed with the measuring of the electricity speed, making it to «flow» 12 000 feet.

One of the major results of the invention of the Leyden jar was the establishment of influence of electric charges on the organism of a man, which brought to the origin of electromedicine - it was the first comparatively wide practical application of electricity, having played a great role in deepening the study of the electric phenomena.

The experiment of Muskhenbruk was repeated in the presence of the French king by abbot Nolle. He formed the chain from 180 guardsmen who were standing hand by hand, by the way the first held a jar in the hand, and the last touched with the wire, producing a spark. «A blow was felt by all of them in one moment; it was odd to see the variety of gestures and hear the instantaneous cry of dozens of people». The term «electric chain» was derived from this chain of soldiers.

The construction of the Leyden jar was gradually perfected: the water was replaced with a gas, and then an outward surface was covered with leaden laminas; the internal and outward surfaces later began to be covered with a tin foil, and the jar got a modern look.

During the researches with the jar it was established (in 1746 by England B. Wilson) that the amount of electricity, collected in the jar, is proportioned to the amount of facings and inversely proportioned to the thickness of the isolation layer. In 70s of XVIII century the metal plates began to be divided not with a glass, but with an air space — so, the simplest condenser appeared.

6. Дайте відповідь на питання:

1. Who first developed the first theories of the Leyden jar?
2. What science was brought to the origin?
3. What experiment was repeated in the presence of the French king by abbot Nolle?
4. What term was derived from this chain of soldiers?
5. What way was the construction of the Leyden jar gradually perfected?

7. Складіть стислий конспект тексту.

Контрольне завдання №2.

Варіант 4.

Граматика:

1. Рід та відмінок іменників. (Gender and Case)
2. Артикль (The Definite article).

3. Займенник (Pronouns). Особові займенники (Personal pronouns). Питальні та відносні займенники (Interrogative and relative pronouns). Невизначені займенники (Indefinite pronouns).

4. Числівник (Numerals).

5. Дієслово (Verb). Дієслова to be, to have. Особові та неособові форми дієслів (Personal non-personal verbs). Правильні та неправильні дієслова (Regular and irregular verbs). Перехідні та неперехідні дієслова (Transient and intransient verbs). Самостійні та допоміжні дієслова (Independent and auxiliary verbs). Модальні дієслова (Modal verbs – should, would). Дієслова-зв'язки. Спосіб дієслів (Mood) - Subjunctive Mood. Стан дієслів (Voice) - Active and Passive Voice. Вид та число дієслів (Person and number). Час дієслів – Минулий невизначений час (Past Indefinite/Simple Tense). Узгодження часу (Sequence of tenses).

Завдання:

1. Перекладіть та поставте в усіх реченнях правильні граматичні форми:

1. There _____ 3 classes of reactors. (to be)
2. The first law of motion _____ the idea of motion and the idea of force. (to have)
3. Neither ionium nor thorium _____ a pure isotope, each is a mixture. (to have) Each liquid _____ a limited amount of the other. (to dissolve)
4. The velocity of molecules _____ from molecule to molecule. (to differ)
5. The first class _____ the slow-fission reactor. (to be)
6. Molecules of gas _____ moving as fast as bullets. (to be)
7. Figure 6 _____ an apparatus for counting the number of alpha-particles. (to show)
8. There _____ 3 classes of reactors: slow, intermediate and fast. (to be)

2. Перекладіть та поясніть усі граматичні явища у реченні:

1. A vector has direction as well as magnitude.

2. In gas the molecules will not get in each other's way, nor will they greatly attract or repel each other.
3. Gases have neither size nor shape of their own, but take both from the containing vessel.
4. Ionium and thorium have different atomic weights. Neither atomic weight is a whole number.
5. Helium has four times the mass, and twice the charge of a proton.
6. Subtract 92 from 238 and the remainder is the number of neutrons in uranium-238.
7. On the moon itself the force of gravitation is one sixth as much as it is on the earth.
8. The propeller theory was worked out by N.E.Zhukovsky.

3. Перекладіть та поясніть усі граматичні явища у реченні:

1. In order that such a change may be possible, heat must be removed from the gas.
2. We are to finish with the experiments in two months at the most.
3. Even today we cannot directly measure the dimensions of most molecules.

4. Перекладіть та поясніть усі граматичні явища у реченні:

1. Pulling a rubber band increase its length.
2. To invent a perpetual motion machine is impossible
3. Induction does not require bringing a conductor and a charged object in contact.
- 4.To study radioactive elements is of great interest and importance.

5. Перекладіть текст:

The equation of the strength of current introduced by Ohm

Ohm hoped that his experimental works would open him a way to a university, what he wished so much. However the articles were unnoticed. Then he left the position of a teacher in the gymnasium in Koln and went to Berlin, in order to the theory produced certain results. In 1827 in Berlin he published his main work «Galvanic chain, developed mathematically»).

This theory, at the development of which he was so inspired with, as we noted, with the analytical theory of heat of Furie, introduced the concepts and exact determinations of electromotive force, or «electroscopic forces», as it was named by Ohm, conductivity and the strength of current. Expressing the law shown out by him differentially, which was introduced by modern authors, Ohm wrote it down in quantities for special cases of the concrete electric chains where the thermo-electric chain was especially important. On this basis, he formulates the well-known laws of the change of electric tension along the chain.

But theoretical research of Ohm also remained unnoticed, and if anybody wrote about it, it was only in order to humour «a sick fantasy the only purpose of which is to humiliate the dignity of nature». And only ten years after his genius works gradually began to gain recognition: in Germany they were estimated by Poggendorf and Fekhner, in Russia — by Lenz, in England — by Witson, in America - by Henry, in Italy — by Matteuchi.

Simultaneously with the experiments of Ohm in France Bekkerel also carried out the experiments, and in England — it was Barlow. The experiments of the

first are especially remarkable with the introduction of the differential galvanometer with the double puttee of the scope and the application of a «zero» method of measuring. The experiments of Barlow are needed to be mentioned because they experimentally confirmed the constancy of the strength of current in all of the chain. This conclusion was tested and widespread on the internal current of a battery of Fekhner in 1831, generalized in 1851 by Rudolf Kolraush (1809—1858) on liquid conductors, and then once again confirmed with the careful experiments of Gustavus Nidman (1826—1899).

After the publication of the first article of Ohm Poggendorf advised him to give up chemical elements and better to use the thermocouple - copper and bismuth, not long before introduced by Sehebeck. Ohm took this advice for granted and repeated the experiments, having constructed the device with a thermo-battery, in the external chain of which eight copper wires of the identical diameter, but of different length were introduced. He measured the strength of current with the help of some kind of turning scales, which were formed with a magnetic pointer, suspended on a metallic filament. When the current, parallel to a pointer, declined it, Ohm twirled a filament which was suspended on, while the pointer did not appear in the position; the strength of current was considered proportional to the corner which a filament was twirled on.

Ohm came to the conclusion, that the results of experiments, conducted with eight different wires, «could be expressed very well with the equation

$$X = a / (b + x),$$

where X means the intensity of a magnetic action of the conductor, the length of which is equal to x, and a and b are constants, depending

accordingly on the excitant force and from the resistance of other parts of the chain»

The terms of the experiment changed: the resistance and thermo-electric pair was replaced, but the results were however taken to the formula which very simply passed to a well-known to us equation resulted higher, if to replace X with the strength of current, the electromotive force and $(b + x)$ with the resistance of a chain.

Having discovered this formula, Ohm used it for studying the action of multiplier of Shveygger on the rejection of a pointer and for studying of the current which passed in the external chain of the battery of elements, depending on the way they were united consistently or parallel. He explains (as it is done in textbooks) thus, what is the determiner of the external current of a battery, that is a question which was too vague for the first researchers.

6. Дайте відповідь на питання:

1. What conclusion did Ohm come to?
2. How did the terms of the experiment change?
3. What did Ohm use having discovered this formula?
4. What theory was he so inspired with?
5. What phenomenon was named by Ohm?

7. Складіть стислий конспект тексту.

Контрольне завдання №2.

Варіант 5.

Граматика:

1. Рід та відмінок іменників. (Gender and Case)
2. Артикль (The Definite article).
3. Займенник (Pronouns). Особові займенники (Personal pronouns). Питальні та відносні займенники (Interrogative and relative pronouns). Невизначені займенники (Indefinite pronouns).
4. Числівник (Numerals).
5. Дієслово (Verb). Дієслова to be, to have. Особові та неособові форми дієслів (Personal non-personal verbs). Правильні та неправильні дієслова (Regular and irregular verbs). Перехідні та неперехідні дієслова (Transient and intransient verbs). Самостійні та допоміжні дієслова (Independent and auxiliary verbs). Модальні дієслова (Modal verbs – should, would). Дієслова-зв'язки. Спосіб дієслів (Mood) - Subjunctive Mood. Стан дієслів (Voice) - Active and Passive Voice. Вид та число дієслів (Person and number). Час дієслів – Минулий невизначений час (Past Indefinite/Simple Tense). Узгодження часу (Sequence of tenses).

Завдання:

1. Перекладіть та поставте в усіх реченнях правильні граматичні форми:

1. An "oxygen unit" _____ 1/16 of the weight of an atom of oxygen. (to be)
2. In mechanics we _____ energy as either kinetic or potential. To which of these classes _____ heat _____? (to classify, to belong)
3. It _____ that the language of figures _____ the most convincing language. (to be said, to be)
4. The earth and other planets _____ around the sun and at the same time they _____ about their own axes too. (to move, to rotate)
5. A vector _____ direction as well as magnitude. (to have)

6. In gas the molecules _____ in each other's way, nor will they greatly attract or repel each other. (will, not, get)
7. Gases _____ neither size nor shape of their own. (to have)
8. The Fahrenheit scale _____ quite inconvenient, still it _____ in England and the USA. (to be, to be used)

1. Перекладіть та поясніть усі граматичні явища у реченні:

1. The doctrine of conditioned and unconditioned reflexes was created by Pavlov, who devoted his whole life to the cause of science.
2. Gases and liquids return to their original volume as soon as the applied force is removed.
3. The ball possesses a definite store of potential energy while it is in the elevated position.
4. The average speed of all molecules remains the same as long as the temperature is constant.
5. Since rubber is a non-conductor of electricity, it is used for insulation.
6. The intensity of the current in a circuit decreases if the resistance of the circuit is increased.
7. Gases are characterized by extreme lightness unless they are highly compressed.
8. There appeared startling bright flashes of white light.

3. Перекладіть та поясніть усі граматичні явища у реченні:

1. Under certain circumstances, a second electron may enter the outer orbit.
2. An alloy steel may be defined as a steel to which elements other than carbon are added.
3. Electrical energy may be changed into radiant energy, or it can be changed into mechanical energy.

4. Перекладіть та поясніть усі граматичні явища у реченні:

1. The penetrating of slow neutrons into the nucleus is easily effected.
2. The molecules forming a body are called atoms.

3. If you want to slow a molecule, let it do some work.
4. The period T is the time required for a particle to make one complete vibration.

5. Перекладіть текст:

The Development of Electrodynamics after Volta

Nobili was the follower of Volta, and therefore explained the origin of the registered potentials that one areas of tissues are warmer, than others, as the evaporation of a liquid from different points cannot be strictly identical. So Nobili does not pay attention to the important discovery. The authority of Volta impeded him the same the authority of Dzhilberta impeded Galvani.

Since 1837 another Italian scientist Matteuchi has used galvanometer for the true check-up of experiments of Galvani and his followers.

Foremost, Matteuchi discovered that between the intact and the damaged areas of a muscle there was a difference of potentials; thus the cut of a muscle always plays the role of a negative pole. The current, flowing to the damaged place, was the current of damage. This result of Matteuchi gave the explanation to two first experiments of Galvani, in fact Galvani supposed that the electric fluid flowed between the intact and the damaged areas of a muscle. It's true, that Matteuchi was only able to register the current of damage of a muscle, but not of a nerve (the sensitiveness of the device was not enough). But if to consider the analogous situation for the damaged nerve, it's clear, that the place of a cut of the nerve served as a source of the current which in the first experiment excited the muscle of a frog, and in the second its nerve.

Matteuchi discovered that during the excitation of the damaged muscle the current of damage decreased for some reason. It surprised an experimenter

very much. It would seem, that at the excitation it must continuously increase, but not decrease!

Finally, Matteuchi made the third experiment of Galvani widely known. Matteuchi showed in fact, that at the excitation of an uncrippled muscle an electric current which flows between its parts can excite a lying on it nerve. Works of Matteuchi carried the principle : while the paw of a frog served as the measuring device before, there was no confidence that the processes of excitation are related to the electric phenomena.

It could have been taken for granted after the works of Matteuchi. We will remind you that this took place in 1837. It was the year of a century from the day of the birth of Galvani and the year of his post-mortal triumph. The rightness of the explanation of his last experiments was well-proved by Matteuchi. Already in 1841 the complete volume of Galvani's works appears. Galvani becomes famous and this time it's forever.

6. Дайте відповідь на питання:

1. What did Nobili explain?
2. What did Matteuchi discover experimenting on a cut of a muscle?
3. What did Matteuchi register?
4. What did Matteuchi discover during the excitation of the damaged muscle?
5. What experiment did Matteuchi make?

7. Складіть стислий конспект тексту.

Контрольне завдання №3.

Варіант 1.

Граматика:

1. Присвійні займенники (Possessive pronouns). Зворотні займенники (Reflexive pronouns). Взаємні займенники (Reciprocal pronouns). Вказівні займенники (Demonstrative pronouns).
2. Прикметник (Adjective). Ступені порівняння прикметників.(The Degrees of Comparison).
3. Наріччя (Adverbs). Ступені порівняння (The Degrees of Comparison).
4. Сполучники (Conjunctions).
5. Дієслово (Verb). Дієслова to be, to have. Особові та неособові форми дієслів (Personal non-personal verbs). Перехідні та неперехідні дієслова (Transient and intransient verbs). Самостійні та допоміжні дієслова (Independent and auxiliary verbs). Модальні дієслова (Modal verbs– should, would). Дієслова-зв'язки. Спосіб дієслів (Mood). Стан дієслів (Voice) - Active and Passive Voice. Вид та число дієслів (Person and number). Час дієслів – Теперішній тривалий час (Present Continuous/Progressive Tense) Минулий тривалий час (Past Continuous/Progressive Tense) та Майбутній тривалий час (Future Continuous/Progressive Tense). Узгодження часу (Sequence of tenses).

Завдання:

1. Перекладіть та поставте в усіх реченнях правильні граматичні форми:

1. We _____ a radio station with a frequency of 1,000,000 oscillations per second. (to receive)
2. While a current _____ through a wire, the latter _____. (to flow, to be heated)
3. Matter _____ constantly _____ and _____ constantly _____. (to change, to move)

4. We _____ the velocity of the particle to _____ continuously _____ if this particle _____ non-uniform motion.
(to know, to change, to have)
5. The article _____ with microwaves, with particular attention _____ to radio location. (to deal, to be paid)
6. Fur, copper, gold and even water _____ electrons. (to yield)
7. The volume of gas _____ proportional to its absolute temperature provided its pressure _____ constant. (to be, to remain)
8. The heavier air _____ the lighter gas upward as a piece of wood _____ to the surface of the water because it _____ lighter than water.
(to crowd, to be forced, to be)

2. Перекладіть та поясніть усі граматичні явища у реченні:

1. The molecules of hydrogen hit as hard as the molecules of chlorine do.
2. The greater the molecular velocity, the higher is the temperature of the body.
3. In the case of gas, the molecules are much too far from each other to repel each other.
4. If we compress gas it becomes hotter.
5. A liquid does not become hotter, as it continues to boil.
6. Gas is made up of a good deal of emptiness and very few molecules.
7. A liquid hasn't a shape of its own.
8. What does the dry cell consist of?

3. Перекладіть та поясніть усі граматичні явища у реченні:

1. We can use the same rotating machine either as a generator or as a motor.
2. I can perform the experiment alone.
3. Heat can melt ice, vaporize water and cause bodies to expand.

4. Перекладіть та поясніть усі граматичні явища у реченні:

1. On breaking the magnet into still shorter pieces, we still get complete magnets.
2. Warming this solid converts it directly to gas.
3. Capturing a slow neutron uranium fissions.
4. We know the electron to be a part of all atoms.
5. At the continued heating of a solid body the movement of its molecules becomes still faster.

5. Перекладіть текст:

First research of the resistance of conductors

What is a conductor? It is a purely passive component of a part of the electric chain, the first researchers answer. To be engaged in this research means simply to rack one's brains above unnecessary riddles, because only a source of current is an active element.

Such a look on the thing explains to us, why scientists, at least to 1840, are not interested either in those few works which are being conducted in this direction. So, on the second convention of the Italian scientists, taking place in Turin in 1840 (the first was going in Pizza in 1839 and even gained a certain political meaning), De La Riv is coming forward in the debates on the lecture, presented by Marianini, asserting that the conductivity of most liquids is not absolute, «and rather a relative one and changes with a variation of the strength of current». But the law of Ohm was published 15 years prior to it!

Among those not many scientists which first began to be engaged in the question of conductivity of conductors after the invention of galvanometer, was Stefano Marianini (1790—1866). He discovered it by chance, while he

was studying the tension of batteries. He noticed that with the increase of the number of elements of the Volta's post the electromagnetic effect on a pointer was not increasing noticeably. It made Marianini at once to think, that each of the voltaic elements was an obstacle for the passing of current. He is making experiments with pairs of «active» and «idle» (i.e. consisting of two copper plates, divided with a moist gasket) and experimentally finds a way relatively to which a modern reader knows the special case of the law of Ohm, when the resistance of an external chain is not taken into account, as it was in the experiment of Marianini.

George Simon Om (1789—1854) acknowledged the merits of Marianini, although his works did not help much Ohm in his process. Ohm who was inspired in his research work with «The analytical theory of heat», Paris, 1822 of Jean Cambric of Furie (1768—1830) (one of the most advanced studies of all the times), got very quickly the fame and high estimate among mathematicians and physicists of that time. An idea, that the mechanism of the «thermal stream», which Furie is talking about, is possible to liken to the electric current in a conductor, came to Ohm. And that thermal stream between two bodies or between two points of the same body in the theory of Furie explains the difference of temperatures, Ohm explains the difference of «electroscopic forces» in two points of the conductor with the origin of the electric current between them.

Adhering to such an analogy, Ohm is beginning his experimental research with the determination of relative sizes of conductivity of different conductors. Having applied the method which became classic now, he was connecting consistently thin conductors from different materials of the identical diameter between two points of the chain and changing their

length so that a certain magnitude of current was produced. The first results which he succeeded to get might seem modest today.

Historians are struck, for example, with the fact that according to the measuring of Ohm silver possesses less conductivity, than copper and aurum, and accepting Ohm's further explanation, according to which the test with a wire covered with a layer of silver, was carried out which led to a mistake in relation to the exact meaning of diameter.

At that time there were a great number of scientists who were carrying out tests (insufficient purity of metals, difficulty of calibration of the wire, the difficulty of the exact measuring, etc.). The major source of them was the polarization of batteries. The (chemical) elements then were yet unknown, so that for the time, necessary for measuring, the electromotive force of the element changed substantially. Namely these reasons, having caused errors, resulted in the fact that Ohm on the basis of his experiments came to the logarithmic law of the dependence of the strength of current from resistance of a conductor, between two points of the chain.

6. Дайте відповідь на питання:

1. What is a conductor?
2. What did Stephano Marianini discover by chance, studying the tension of batteries?
3. What was he experimenting with?
4. What differences did Furie and Ohm explain?
5. What is Ohm beginning his experimental research with?

7. Складіть стислий конспект тексту.

Контрольне завдання №3.

Варіант 2.

Граматика:

1. Присвійні займенники (Possessive pronouns). Зворотні займенники (Reflexive pronouns). Взаємні займенники (Reciprocal pronouns). Вказівні займенники (Demonstrative pronouns).
2. Прикметник (Adjective). Ступені порівняння прикметників.(The Degrees of Comparison).
3. Наріччя (Adverbs). Ступені порівняння (The Degrees of Comparison).
4. Сполучники (Conjunctions).
5. Дієслово (Verb). Дієслова to be, to have. Особові та неособові форми дієслів (Personal non-personal verbs). Перехідні та неперехідні дієслова (Transient and intransient verbs). Самостійні та допоміжні дієслова (Independent and auxiliary verbs). Модальні дієслова (Modal verbs– should, would). Дієслова-зв'язки. Спосіб дієслів (Mood). Стан дієслів (Voice) - Active and Passive Voice. Вид та число дієслів (Person and number). Час дієслів – Теперішній тривалий час (Present Continuous/Progressive Tense) Минулий тривалий час (Past Continuous/Progressive Tense) та Майбутній тривалий час (Future Continuous/Progressive Tense). Узгодження часу (Sequence of tenses).

Завдання:

1. Перекладіть та поставте в усіх реченнях правильні граматичні форми:

1. Note the direction in which the conductor _____ at a given moment. (to move)
2. Just as water _____ the most important of liquids, so the air _____ the most important of gases. (to be, to be)
3. Not only _____ the position of the earth _____ but the earth itself _____ changes. (to change, to undergo)
4. Quantities which _____ both magnitude and direction _____ vector quantities. (to have, to be)

5. Insulators in reality _____ a current, but their resistance _____ very high. (to conduct, to be)
6. The Fahrenheit scale _____ quite inconvenient, still it _____ in England and the USA. (to be, to be used)
7. Since displacement _____ direction velocity also _____ direction. (to have, to have)
8. A tested specimen _____ before a rupture _____ place. (to elongate, to take)

2. Перекладіть та поясніть усі граматичні явища у реченні:

1. The bodies are statically balanced if they remain still in any position.
2. Heat is the energy produced by the movement of molecules.
3. If we compress gas it becomes hotter.
4. Gases have neither size nor shape of their own.
5. Gases expand and contract not only when the temperature alters but also when the air pressure alters.
6. The coefficient of expansion of air is about twenty times as much as that of mercury.
7. Forces are vector quantities.
8. The process of one substance mixing with another is called diffusion.

3. Перекладіть та поясніть усі граматичні явища у реченні:

1. One cannot see a reactor itself, only its cover.
2. According to the law of gravitation any two objects are attracted to each other, in other words, everybody must have an attraction for every other body.
3. There must be some solution of the problem.

4. Перекладіть та поясніть усі граматичні явища у реченні:

1. Gases and liquids are perfectly elastic, after their being compressed they return to their original volume as soon as the applied force is removed.

2. Mankind is interested in atomic energy being used only for peaceful needs.
3. The melting ice or snow keeps the same temperature while melting.
4. The beta-rays are negative electrons moving with high velocity.

5. Перекладіть текст:

The Experiments of Volta

The observation, made by Galvani on September, 26' 1786, in the day of the birth of electric biology, had the reason of a pure physical phenomenon on the basis of which Volta invented the source of the continuous current: the galvanic element, or the Volta's post.

This invention will be a result of the intensive development of studies about electricity and electrical engineering and will make XIX age not only the age of steam but also electricity.

This conclusion Volta is supporting with the whole number of various experiments. For example, Volta is taking wires from silver and tin, connecting one tip of these wires to each other, and is touching the proglossis to other tips: one metal to the proglossis, another a bit farther.

You remember that in the time we described it was popular to stage showy experiments. Such an experiment as Galvani thought, was an «electric nervous pendulum», - when the paw of a frog, suspended on a copper hook, is touching a small silver box. (All the thing here is just in copper and silver! — Volta would say.) And Volta also was thinking of a showy experiment.

Four people «...are making a chain one by one, thus one is touching a finger to the proglossis of a neighbour, the other is doing in the same way to the surface of an eyeball of the other neighbour, and two more are holding with

wet fingers one for a paw, and another for the back of a freshly-prepared... frog».

Finally, the first in a row is holding a zinc plate with a wet hand, and the last is holding a silver plate, and then they are driving these plates to the mutual contiguity.

At that moment on the top of the proglossis of the man who is holding zinc in his hand, a feeling of sour is appearing; and in an eye of the neighbour whose finger is touching to - a feeling of light flash is appearing; and at the same time paws of a frog, being in two hands, are beginning to be strongly contracted».

All of the nerves, appearing on the way of an electric fluid are nerves of the proglossis, nerves of an eye, nerves of a frog, - and are simply very sensible electrometers, and metals, from contiguity of which there is an effect, are not simple conductors, but «engines» of electricity.

6. Дайте відповідь на питання:

1. What were the outcomes of the observation, made by Galvani on September, 26' 1786?
2. What experiment was Volta carrying out to support his conclusion?
3. What was the most showy experiment of all that Volta carried out?
4. What was it going on in the process of it?
5. What were the outcomes of this experiment?

7. Складіть стислий конспект тексту.

Контрольне завдання №3.

Варіант 3.

Граматика:

1. Присвійні займенники (Possessive pronouns). Зворотні займенники (Reflexive pronouns). Взаємні займенники (Reciprocal pronouns). Вказівні займенники (Demonstrative pronouns).
2. Прикметник (Adjective). Ступені порівняння прикметників.(The Degrees of Comparison).
3. Наріччя (Adverbs). Ступені порівняння (The Degrees of Comparison).
4. Сполучники (Conjunctions).
5. Дієслово (Verb). Дієслова to be, to have. Особові та неособові форми дієслів (Personal non-personal verbs). Перехідні та неперехідні дієслова (Transient and intransient verbs). Самостійні та допоміжні дієслова (Independent and auxiliary verbs). Модальні дієслова (Modal verbs– should, would). Дієслова-зв'язки. Спосіб дієслів (Mood). Стан дієслів (Voice) - Active and Passive Voice. Вид та число дієслів (Person and number). Час дієслів – Теперішній тривалий час (Present Continuous/Progressive Tense) Минулий тривалий час (Past Continuous/Progressive Tense) та Майбутній тривалий час (Future Continuous/Progressive Tense). Узгодження часу (Sequence of tenses).

Завдання:

1. Перекладіть та поставте в усіх реченнях правильні граматичні форми:

1. Changes _____ continually _____ place in the properties of bodies around us. (to take)
2. The particles _____ faster in the place where the body _____ _____. (to move, to be heated)
3. A suitable lever _____ it possible to exert a large force by the application of a small force. (to make)
4. All gases at the same temperature _____ the same average molecular kinetic energies. (to have)

5. Each atom _____ something similar to our solar system. (to represent)
6. Almost all metals _____ electricity. (to conduct)
7. The beta-rays _____ greatly in penetrating power. (to vary)
8. The source of sound _____ always in a state of vibration. (to be)

2. Перекладіть та поясніть усі граматичні явища у реченні:

1. Cells are connected in series or parallel.
2. When a rocket moves away from the Earth, the Earth's gravitational force will naturally become less and less.
3. There are many kinds of atoms, one or more for each chemical element.
4. Is there a difference of potential between the earth and the atmosphere?
5. What temperature does aluminium melt?
6. How do atoms arrange themselves in a solid?
7. How much does the volume of water change at freezing?
8. The most common acceleration is that of freely falling bodies.

3. Перекладіть та поясніть усі граматичні явища у реченні:

1. Steam traps shall be installed wherever steam may collect.
2. In order that an inflammable gas may burn in air, it must first be raised to the ignition temperature.
3. Flowers frozen in liquid air can be broken with a hammer as if they were made of glass.

4. Перекладіть та поясніть усі граматичні явища у реченні:

1. The potential of a conductor rises because of the electrons being crowded upon a conductor.
2. The article deals with microwaves, particular attention being paid to radio location.
3. It is when an object is heated that the average speed of molecules is increased.

4. What happens to the molecules of a body at heating?

5. Перекладіть текст:

The Experiments of Volta

Volta discovers that if silver is attached to the proglossis, alkaline taste is felt, and if tin — that of sour. If the source of electricity is a muscle of the proglossis, then the taste must not be changing as a result of the change of a locking metal, - reasons Volta. But if the source of electricity is the act of two heterogeneous metals, then it's clear, that changing their places, we are changing the position of «plus» and «minus». In these cases electric fluid is included in the nerves of a proglossis, and in the other — it goes out of them. It causes different taste. Can there be work of all the sense-organs related to electricity? — asks Volta (and as we know now, it's just like this).

«Thus, instead of speaking about animal electricity, it would be possible to speak to a large extent about metallic electricity» (Volta, 1794). In fact if people in that chain made of four people will not be holding silver and zinc, but will simply be touching the hands of each other, nothing will happen. According to Galvani, the charge of the «living Leyden jar» which is in a frog must travel yet more successfully, because locking of a chain becomes shorter when a sector is taken away, adding nothing; and an effect is not present. It means that the reason is not in a frog, but in metals — in the contact of silver and zinc.

From the above-mentioned examples it is clear, that Volta was right. There is no evidence of existence of «animal electricity in the famous treatise of Galvani».

In spite of the help of friends and followers, the support of such an outstanding naturalist, as A. Gumboldt, Galvani lost the dispute to Volta. The

arguments of Volta seemed fully convincing. A final crash comes in 1797: on political reasons. Galvani was driven out of the university. He was deprived of the chance to work and in a year he died.

However this time Volta made a mistake. In all of three experiments mentioned above Galvani indeed was dealing with «animal electricity» which he at last succeeded to discover.

After the invention of the source of continuous current Volta becomes famous and well-acknowledged. In 1801, Napoleon invites him to Paris, where in the Academy of sciences he is demonstrating the famous Volta's post». Died Volta in 1827, at the age of 82, covered with glory.

6. Дайте відповідь на питання:

1. What does Volta discover?
2. What was Volta right in?
3. What experiment was Volta carrying out with a muscle of a proglossis?
4. What was Volta's mistake?
5. What invention does Volta become famous and well-acknowledged after?

7. Складіть стислий конспект тексту.

Контрольне завдання №3.

Варіант 4.

Граматика:

1. Присвійні займенники (Possessive pronouns). Зворотні займенники (Reflexive pronouns). Взаємні займенники (Reciprocal pronouns). Вказівні займенники (Demonstrative pronouns).

2. Прикметник (Adjective). Ступені порівняння прикметників.(The Degrees of Comparison).
3. Наріччя (Adverbs). Ступені порівняння (The Degrees of Comparison).
4. Сполучники (Conjunctions).
5. Дієслово (Verb). Дієслова to be, to have. Особові та неособові форми дієслів (Personal non-personal verbs). Перехідні та неперехідні дієслова (Transient and intransient verbs). Самостійні та допоміжні дієслова (Independent and auxiliary verbs). Модальні дієслова (Modal verbs– should, would). Дієслова-зв'язки. Спосіб дієслів (Mood). Стан дієслів (Voice) - Active and Passive Voice. Вид та число дієслів (Person and number). Час дієслів – Теперішній тривалий час (Present Continuous/Progressive Tense) Минулий тривалий час (Past Continuous/Progressive Tense) та Майбутній тривалий час (Future Continuous/Progressive Tense). Узгодження часу (Sequence of tenses).

Завдання:

1. Перекладіть та поставте в усіх реченнях правильні граматичні форми:

1. This copper _____ separated from the solution while the current _____ through it. (to become, to pass)
2. Every substance _____ constantly _____ radiant heat. (to emit)
3. There _____ no perfect conductors: to this class of substances _____ mica, porcelain, quarts, glass, wood, ebonite, etc. (to be, to belong)
4. In front of this screen AB _____ two screens CD and DF, each with a small hole at the centre. (to place)
5. There _____ many sources of energy, both potential and kinetic. (to exist)
6. What _____ mass? (to be)
7. What _____ resultant forces? (to be)
8. What _____ physical properties of matter? (to be)

2. Перекладіть та поясніть усі граматичні явища у реченні:

1. 300,000,000 is the velocity of light in meters per second.
2. While 1 mm. of aluminum will stop all alpha-rays, 6 cm are required to stop all beta-rays.
3. The earth and other planets move around the sun.
4. Liquids as well as solids, becomes radioactive when put through a nuclear reactor.
5. Gases, as well as liquids, return to their original as soon as the applied force is removed.
6. Subtract 92 from 238 and the remainder is the number of neutrons in uranium-238.
7. This gives the lens a short focal length.
8. The rheostat controls current by changing resistance.

3. Перекладіть та поясніть усі граматичні явища у реченні:

1. In engineering have to do with pressure much greater than that of air.
2. To obtain emission of electrons the emitting surface should be heated.
3. Since the air can be compressed, it is clear that between the molecules of air there are free spaces.

4. Перекладіть та поясніть усі граматичні явища у реченні:

1. When out of the flame it again becomes magnetic.
2. In moving about molecules make repeated collisions with their neighbours.
3. Compressing gas we turn it into liquid.
4. While heated in a closed vessel coal gives off large quantities of gas.

5. Перекладіть текст:

The development of fundamentals of electrodynamics

Ampere's researches in the sphere of electromagnetism opened a new page in the history of the electrical engineering. And at the study of these phenomena the striking abilities of Ampere are showing up brightly.

He first knows about the experiments of Oersted on the meeting of the Parisian Academy of Sciences, where he repeats them during the report of Arago. Together with the admiration Ampere feels importance of this discovery intuitively, although before he is not engaged in the study of the electromagnetic phenomena.

And exactly in a week (only in a week!) on September, 18' 1820 Ampere is coming forward on the meeting of the Academy with the lecture about co-operation of currents and magnets, and then almost in succession — week after week (the Academy of Sciences held sessions weekly) he is stating in the face of the largest French scientists the results of the experimental and theoretical general conclusions which were later embodied in his famous works on electrodynamics.

In one of letters Ampere underlines that he «created a new theory of the magnet, taking all of the phenomena with the phenomena of galvanism». The logic of his general statement is striking: if the current is a magnet, then two kinds of the current must interact like magnets. Now it seems obvious, but before Ampere nobody specifies this fact so expressly. The brilliant knowledge in the sphere of mathematics allows Ampere to generalize the theory and his research and to formulate the known law, named after him.

The philosophical work of Ampere «The experience of the philosophy of sciences, or the analytical exposition of the natural classification of all the human knowledge» (1834) deserves attention. A lot of works, devoted to the research of the «science of sciences», are published in our time. With the «Classification» Ampere paved the bases of this important sphere of the scientific knowledge more than one hundred years ago.

We will consider the works of Ampere in the area of electromagnetism in detail.

We will think that Ampere is the first to introduce the term «electric current» and the concept of the direction of electric current. By the way, he suggests to measure the direction of a current as the "motion of the positive electricity" (from plus to minus in an external chain).

Looking after the aberration of the needle under the influence of the flowing along the conductor current, Ampere manages to formulate the rule, allowing to define the direction of rejection of a pointer depending on the direction of current in a conductor.

This rule is at that time widely known under the name of the «rule of the swimmer» and it is formulated as follows: «If a man to be mentally disposed so that the current is passing a step direction from the feet of the observer to the head and that the face of him is turned to the magnetic pointer, under the influence of current the north pole of a magnetic pointer will always deviate to the left».

An especially important value is the research of the interaction of circular and linear currents made by Ampere. To this research he comes up, relying on the reasoning: if a magnet according to its properties is analogous to a spool

or a circular conductor, streamlined with the current, then two circular currents must act on each other like two magnets.

6. Дайте відповідь на питання:

1. What opens a new page in the history of the electrical engineering?
2. What happened on September' 18 in 1820?
3. What philosophical work of Ampere deserves attention?
4. What does Ampere manage to formulate looking after the aberration of the needle under the influence of the flowing along the conductor current?
5. What name is the rule known under and what it is formulated as?

7. Складіть стислий конспект тексту.

Контрольне завдання №3.

Варіант 5.

Граматика:

1. Присвійні займенники (Possessive pronouns). Зворотні займенники (Reflexive pronouns). Взаємні займенники (Reciprocal pronouns). Вказівні займенники (Demonstrative pronouns).
2. Прикметник (Adjective). Ступені порівняння прикметників.(The Degrees of Comparison).
3. Наріччя (Adverbs). Ступені порівняння (The Degrees of Comparison).
4. Сполучники (Conjunctions).
5. Дієслово (Verb). Дієслова to be, to have. Особові та неособові форми дієслів (Personal non-personal verbs). Перехідні та неперехідні дієслова (Transient and intransient verbs). Самостійні та допоміжні дієслова (Independent and auxiliary verbs). Модальні дієслова (Modal verbs– should, would). Дієслова-зв'язки. Спосіб дієслів (Mood). Стан дієслів (Voice) –

Active and Passive Voice. Вид та число дієслів (Person and number). Час дієслів – Теперішній тривалий час (Present Continuous/Progressive Tense) Минулий тривалий час (Past Continuous/Progressive Tense) та Майбутній тривалий час (Future Continuous/Progressive Tense). Узгодження часу (Sequence of tenses).

Завдання:

1. Перекладіть та поставте в усіх реченнях правильні граматичні форми:

1. Gases _____ by extreme lightness unless they _____ highly _____. (to be characterized, to be compressed)
2. In addition to these seven fields of physics, another field known as biophysics _____ rapidly _____. (to develop)
3. The research work _____ on in the course of two years. (to go)
4. The most important elements in ordinary steel _____ iron and carbon; the latter _____ chemically _____ with iron. (to be, to combine)
5. Some time elapses between the moment the sound _____ and the time echo _____. (to originate, to hear)
6. Radioactive isotopes _____ from one another in, for example, the type and energy of the particles they _____. (to differ, to emit)
7. While an object _____ its speed, the acceleration is called negative. (to decrease)
8. The metal _____ up of irregularly shaped grains, and these tiny grains _____ the building blocks of the metal. (to make, to be)

2. Перекладіть та поясніть усі граматичні явища у реченні:

1. No relief valve is required where two pressure reducing valves are installed.

2. As soon as the action of the applied forces is discontinued, the rubber will assume its original form.
3. The heavier air crowds the lighter gas upward as a piece of wood is forced to the surface of water.
4. The stronger an object resists a change in velocity, the greater its inertia is.
5. A liquid does not become hotter as it continues to boil.
6. Stainless steel is different from ordinary steel in that moisture has no effect upon it.
7. When a parallelogram has all four sides equal, it is called a rhombus.
8. Changes are taking place continually in the properties of bodies around us.

3. Перекладіть та поясніть усі граматичні явища у реченні:

1. In order that an inflammable gas may burn in air, it is raised to the ignition temperature.
2. The molecules of a solid body are so strongly attracted to each other that a considerable force must be applied to separate one part of a body from another.
3. Mechanical motion can be transformed into heat, electricity, and magnetism.

4. Перекладіть та поясніть усі граматичні явища у реченні:

1. In case of one of the planetary electrons being detached from the atom, a helium ion is produced.
2. To run a direct current motor it is necessary to connect it to a direct current source.
3. If the mixture be well stirred the temperature will be 20°C.
4. If the magnetized steel ring be cut across at any point, the poles will be found there.

5. Перекладіть текст:

Volta checks up the discovery of Galvani and “ends” it...

So, the faith of Volta in the theoretical points of view of Galvani is strongly ruined. If Galvani could make a mistake, considering exactly a muscle to be the source of «animal electricity», he could do other errors. And Volta has a doubt in the fundamental part of Galvani's work— in existence of «animal electricity».

The appearance of «Treatise...» is causing enormous interest in many different countries. Already his second edition goes out next year. Galvani for a while becomes famous. Many outstanding scientists are being engaged in the reiteration of his experiments and verification of results. Among them was Italian physicist Alessandro Volta, in youth an extra-mural student of abbot Nolle.

At that time (1792) Volta was already the known physicist, professor of university in Pavia, a member of the London Royal Society. By this time he invented a new sensible electroscope, an electric condenser and a row of other devices. His scientific interests through the life are being mainly related to electricity, and work of Galvani made the enormous impression on him.

In the first 10 days after the publishing of «Treatise...» he is carrying out a mass of new experiments, fully confirmed the results of Galvani and aimed to make a contribution in this new domain of science, i.e. to conduct the quantitative study of «animal electricity», measure with electrometers its power and the amount of the charge, necessary to provoke a reduction of a muscle, («In fact it is never possible to do anything valuable, if not to take the phenomena to the degrees and measuring, especially in physics» - wrote Volta).

While making the first experiments he discovered that a preparation of a frog is extremely sensible to the electric charge and reduction arises up at so weak charges of the Leyden jar, which were not revealed with the best electrometers.

Volta diversifies the terms of the experiment, he is doing different preparations, and is applying the conductor in different ways. He is interested in the quantitative side of the experiment, therefore he is searching such terms at which a minimum charge is caused by the reduction of muscles. He finds out thus, that the best of all reduction arises up when an external conductor locks two different sector of a well-prepared nerve. Thus, he draws a conclusion, that it's not a muscle which is running down through a wire and a nerve, and, quite on the contrary, a nerve which is more sensible to the irritation is excited and something passes in a muscle.

Galvani in all his experiments connects one end of the metallic explorer to the nerve, and the other — to the muscle. It is related to his idea that a muscle is the Leyden jar which is charged through a nerve.

Volta puts up a question, why between two near points of the same nerve, which are alike, there is a charge, when they are locked with a conductor? It is against the principle of causality. And why must a locking conductor for the success of an experiment consist of two different metals? In fact, the role of this conductor, according to the Galvani's point of view, is only in locking the chain. But for shorting a chain it is enough to have one type of metal.

Volta is beginning to study this question in detail. He is trying combinations of different pairs of metals. If these metals are acting on a part of a simple conductor, their nature must not have any matter. But if these metals for some reason are the source of electricity (here is a new revolutionary idea of

Volta which succeeded to overcome the authority of Dzhilberta!), then the force of a source can depend on the combination of metals. And Volta finds such dependence.

Operating with two different matters on preparation of a frog the stronger they are, the farther they are put from each other in the following row: zinc tin, lead, iron, brass, bronze, copper, platinum, gold, silver, mercury, graphite, coal.

From this enumeration, resulted in process of 1794, it is evident, how actively Volta was making experiments. The confidence is growing more in him, that the source of electricity in the experiments of Galvani was not a muscle of a frog, but those two metals, which Galvani touched it to.

But Galvani is looking after reductions of muscles and at the use of only one metal! Volta is studying this case in detail and showing that two pieces of copper can contain different admixtures that it is enough to soil one end of a wire, in order to it acts as two different metals, and it is enough for a small difference of temperatures on the opposite edges of the same piece of metal, in order to it acted a part of an irritant etc.

Finally, Volta draws a final conclusion: a contact of two different metals is the new source of electricity which a «living» electroscope reacts on. Exactly this is explained with the experiments of Galvani!

6. Дайте відповідь на питання:

1. What does he discover while making the first experiments?
2. What combination is Volta trying?

3. What row of metals does Volta put operating with two different matters on preparation of a frog?

4. What is Volta studying?

5. What final conclusion does Volta draw?

7. Складіть стислий конспект тексту.

Контрольне завдання №4.

Варіант 1.

Граматика:

1. Дієслово (Verb). Дієслова to be, to have. Особові та неособові форми дієслів (Personal non-personal verbs). Правильні та неправильні дієслова (Regular and irregular verbs). Перехідні та неперехідні дієслова (Transient and intransient verbs). Самостійні та допоміжні дієслова (Independent and auxiliary verbs). Модальні дієслова (Modal verbs– should, would). Дієслова-зв'язки. Спосіб дієслів (Mood). Стан дієслів (Voice) - Active and Passive Voice. Вид та число дієслів (Person and number). Час дієслів – Perfect Tenses - Теперішній досконалий час (Present Perfect Tense) Минулий досконалий час (Past Perfect Tense) та Майбутній досконалий час (Future Perfect Tense). Майбутній досконалий час у минулому. (Future Perfect Tense in the Past). Теперішній досконалий тривалий час (Present Perfect Continuous/Progressive Tense), минулий досконалий тривалий час (Past Perfect Continuous/Progressive Tense) та Майбутній досконалий тривалий час (Future Perfect Continuous/Progressive Tense) Узгодження часу (Sequence of tenses). Наказовий спосіб (The Imperative Mood). Умовний спосіб (The Subjunctive Mood).

Завдання:

1. Перекладіть та поставте в усіх реченнях правильні граматичні форми:

1. We _____ so far _____ examples of relative motion. (to study)

2. We _____ the properties of this material before we _____ it. (to study, to begin, to use)
3. The new turbine _____ for several hours before we gave it a full load. (to be working)
4. Radium _____ by Pierre and Marie Curie in 1898. (to be discovered)
5. He _____ the kingbolt _____. (to say, to be broken)
6. Mendeleev _____ that the vacant places in his table _____ by yet unknown elements. (to predict, would, to be filled)
7. Pierre and Marie Curie _____ radium in 1898. (to discover)
8. A new turbine _____ a full load. (to be given)

2. Перекладіть та поясніть усі граматичні явища у реченні:

1. Mendeleev's Periodic Table of chemical elements, which was created in the second half of the 19th century, had opened a new era not only in chemistry but also in other branches of science.
2. We saw that two pieces of lead would stick together if they were cut smoothly and were joined together immediately after they had been cut.
3. With chromium having been added, strength and hardness of the steel increased.
4. This formula has already been mentioned above.
5. If a current were passed through a solution of silver nitrate, silver would be deposited on the cathode.

3. Перекладіть та поясніть усі граматичні явища у реченні:

1. You should have measured the difference in potential between the points X and Y.
2. If there had been no such accident with the uranium bisulphate, the discovery of radioactivity might have been postponed for a long period of time.
3. Before the eighteenth century people knew hardly anything about gases, they could not even make up their minds whether they were matter at all.

4. The pieces of metal should be kept close, while the welding is carried out.

4. Перекладіть та поясніть усі граматичні явища у реченні:

1. We know of Jacobi's having invented an electromagnetic engine for practical purpose.

2. Chromium having been added, strength and hardness of the steel increased.

3. A voltmeter connected across CD would read 8 volts.

4. The engineer ordered the engine to be started.

5. Перекладіть текст:

The Development of Electrodynamics after Volta

After Volta has invented a galvanic element and physicists has got a source of continuous current, the rapid growth of electrodynamics began, stimulated with a number of practical applications of the electric current. It eventually allowed to find out the rightness of Galvani.

Already in 1800 the thermal action of the current was discovered, in 1803 the book about the Volta's arc by Petrov was published. In 1820 Oersted discovered the act of an electric current on a magnetic pointer, linking scientific phenomena of electricity and magnetism, which had developed separately before. And during a year (it's one more, that the practical uses were not late!) remarkable developments of this invention followed up.

Ampere has pulled out the idea of the electromagnetic telegraph, Barlow and Faraday have made the first primitive models of electric motors, and Shveyger has invented a galvanometer - a device for measuring continuous current. At last a true device for measuring small currents of a frog's paw which have been registered only before appeared.

The galvanometer of Shveyger has been based on the interaction of a spool with a current on a magnetic pointer, but it was also sensible to the magnetic field of the Earth, which interfered greatly to the exact measuring.

In 1821 Ampere suggested to strengthen two magnetic pointers at one axis so, that their opposite poles were located one above another, it allowed to be isolated from the influence of the magnetic-field of the Earth. Shveyger at the beginning has insulated wires with a bees-wax or sealing wax, but over the years in connection with the creation of the telegraph the silk-covered wires appeared. A well-reliable and sensible measuring device has appeared in the hands of physicists.

In 1826—1827 German physicist G. Ohm discovered the law which had his name. For the electrodynamics it was especially important that Ohm introduced the concepts of «strength of the current», «resistance», which had lacked Galvani and Volta.

In 1825 Florentine physicist L. Nobili invented a highly sensitive galvanometer, and in 1827 with the help of this device he was the first to succeed in registering the difference of potentials between the different points of the body of a frog. But, as we have already mentioned, it is simple to experience, but still it's not enough, and what is more important to understand it right.

6. Дайте відповідь на питання:

1. What was discovered in 1803?
2. What did Oersted discover in 1820?
3. What idea has Ampere pulled out?

4. What other discoveries were made then?

5. What did Florentine physicist L. Nobili invent in 1825?

7. Складіть стислий конспект тексту.

Контрольне завдання №4.

Варіант 2.

Граматика:

1. Дієслово (Verb). Дієслова to be, to have. Особові та неособові форми дієслів (Personal non-personal verbs). Правильні та неправильні дієслова (Regular and irregular verbs). Перехідні та неперехідні дієслова (Transient and intransient verbs). Самостійні та допоміжні дієслова (Independent and auxiliary verbs). Модальні дієслова (Modal verbs– should, would). Дієслова-зв'язки. Спосіб дієслів (Mood). Стан дієслів (Voice) - Active and Passive Voice. Вид та число дієслів (Person and number). Час дієслів – Perfect Tenses - Теперішній досконалий час (Present Perfect Tense) Минулий досконалий час (Past Perfect Tense) та Майбутній досконалий час (Future Perfect Tense). Майбутній досконалий час у минулому. (Future Perfect Tense in the Past). Теперішній досконалий тривалий час (Present Perfect Continuous/Progressive Tense), минулий досконалий тривалий час (Past Perfect Continuous/Progressive Tense) та Майбутній досконалий тривалий час (Future Perfect Continuous/Progressive Tense) Узгодження часу (Sequence of tenses). Наказовий спосіб (The Imperative Mood). Умовний спосіб (The Subjunctive Mood).

Завдання:

4. Перекладіть та поставте в усіх реченнях правильні граматичні форми:

1. _____ you _____ anything about nuclear physics? (to read)

2. That lightning is nothing else but an electric spark _____ long _____. (to be known)

3. Before the charged rod _____ the electroscope the leaves of the electroscope _____. (to touch, will, to diverge)
4. A series of investigations _____ that the molecules in all bodies _____ from each other by spaces. (to prove, to be separated)
5. If there _____ no loss of energy by friction, the motion _____ indefinitely. (to be, would, to continue)
6. Then the alternating current _____ into the direct current, which _____ by means of a diode rectifier. (to be converted, to do)
7. The bases of all modern developments in chemistry _____ by the Russian scientist Mendeleyev. (to be laid)
8. A copper wire _____ red-hot because an electric current _____ through it. (to become, to be passed)

4. Перекладіть та поясніть усі граматичні явища у реченні:

1. A current, say, from 1 ma to about j amp has been defined as low.
2. Before the charged rod touched the electroscope the leaves of the electroscope had diverged.
3. We have not noticed any change in the tested bar for two hours.
4. He said, that the new machine would have been working for three hours by the night shift.
5. We knew that if a current were passed through a solution of silver nitrate, silver would be deposited on the cathode.

3. Перекладіть та поясніть усі граматичні явища у реченні:

1. A positive particle moving upward may have produced this track.
2. Thus we could conclude that in the place of striking the molecules had moved closer to each other.
3. I want to build a generator that should give a far more intense beam of neutrons.

4. Should we want to accelerate the motion, we should have to apply some force.

4. Перекладіть та поясніть усі граматичні явища у реченні:

1. If a body moves from one position to another it is said to have had a displacement.

2. Having broken the magnet into still shorter pieces, we still get complete magnets.

3. Only after having applied force we could change the volume and the form of a solid body.

4. Compressing the gas we turned it into liquid.

5. Перекладіть текст:

The interaction of the electric current and the magnet.

A major scientific and methodological value in the expansion of research of the new phenomena has been the works of one of the most prominent French scientists — Andre Mari Ampere (1775—1836), who laid the fundamentals of electrodynamics.

Ampere was extraordinary gifted by nature. In spite that he did not go to school, he did not have teachers, except for his father — a very well-educated merchant, he independently mastered knowledge with striking persistence, and became one of the well-educated people of the time.

Physics and mathematics, astronomy and chemistry, zoology and philosophy — in all of these sciences the encyclopedic knowledge of Ampere has showed up brightly. He was only 13 years, when he presented his first work in mathematics to the Lyon Academy of Sciences, Literature and Arts. By 14 he has already studied all the 20 volumes of the famous «Encyclopedias» by Didro and d'Alamber, and by 18 — he has studied the works of Eyler,

D. Boriulli and Lagrange in perfection, he knew Latin and a few foreign languages.

The private life of Ampere was full of tragic events: at the age of 18, he was shocked with the execution of his father who was a supporter of Jirondists (1793) on the guillotine, and after a few years he buried his favourite wife; a very sorrowful was the fate of his daughter - it caused a serious cardiac disease which took him into the grave.

But in spite of the enormous nervous tension, Ampere has managed to find forces in himself to be tirelessly engaged in the fundamental scientific researches and to make a never fading contribution to the treasure-house of the world civilization.

The value of works of Ampere for the science was very great. Ampere has proved the entity of the electricity and magnetism and the researches and convincingly refuted the reigning ideas about the magnetic liquid before. The laws of mechanical interaction of electric currents formulated by him belong to the number the greatest discoveries in the sphere of electricity.

The prominent contribution made by Ampere was highly estimated (in 1881). The first International congress of electricians has named the unit of strength of the current as «Ampere». He has been named with honour «a Newton of electricity». He has been the member of the Parisian Academy of Sciences (since 1814), and many other Academies of the world, including Petersburg (since 1830).

A new step in the high-quality control of the action of current on a magnet for the determination of the quantitative dependences has been the invention of the law of the action of current on a magnet by French scientists Jean Batista Biot (1774— 1862) and Felix Savar (1791 — 1841).

Conducting a number of experiments, they discovered (1820) the following: «if a wire of unlimited length with the voltaic current flowing along it influences a particle of the North or South magnetism, being at a certain distance from the middle of the wire, then the resultant of all the forces, outgoing from the wire, is directed perpendicularly to the shortest distance of the wire, and the general operating of the wire on any (the South or the North) magnetic element is inversely proportional to the distance of the last to the wire».

Finding out one of the tangential component of the force has allowed to explain the rotor nature of the motion of a conductor in relation to the magnet. French scientist Pierre Simon Laplas (1749—1827) has discovered afterwards, that the force of the action, produced with a small sector of the conductor, changes inversely proportional to the square of the distance.

6. Дайте відповідь на питання:

1. What fundamentals did Andre Mari Ampere lay?
2. What has Ampere proved and formulated?
3. What unit has been named after him?
4. What have Jean Batista Biot and Felix Savar discovered conducting a number of experiments?
5. What has French scientist Pierre Simon Laplas discovered afterwards?

7. Складіть стислий конспект тексту.

Контрольне завдання №4.

Варіант 3.

Граматика:

1. Дієслово (Verb). Дієслова to be, to have. Особові та неособові форми дієслів (Personal non-personal verbs). Правильні та неправильні дієслова (Regular and irregular verbs). Перехідні та неперехідні дієслова (Transient and intransient verbs). Самостійні та допоміжні дієслова (Independent and auxiliary verbs). Модальні дієслова (Modal verbs– should, would). Дієслова-зв'язки. Спосіб дієслів (Mood). Стан дієслів (Voice) - Active and Passive Voice. Вид та число дієслів (Person and number). Час дієслів – Perfect Tenses - Теперішній досконалий час (Present Perfect Tense) Минулий досконалий час (Past Perfect Tense) та Майбутній досконалий час (Future Perfect Tense). Майбутній досконалий час у минулому. (Future Perfect Tense in the Past). Теперішній досконалий тривалий час (Present Perfect Continuous/Progressive Tense), минулий досконалий тривалий час (Past Perfect Continuous/Progressive Tense) та Майбутній досконалий тривалий час (Future Perfect Continuous/Progressive Tense) Узгодження часу (Sequence of tenses). Наказовий спосіб (The Imperative Mood). Умовний спосіб (The Subjunctive Mood).

Завдання:

1. Перекладіть та поставте в усіх реченнях правильні граматичні форми:

1. The elongation of the test specimen _____ after its broken ends _____ together. (to be measured, to be put)
2. Without the instruments he _____ that he _____ in the midst of imminent death. (would, not, to know, to work)
3. The experiment _____ something new in nature. (to reveal)
4. We _____ the picture on the screen 0.1 of a second after it _____ actually. (shall, to see, to disappear)

5. When a cathode _____ into a solution of copper sulphate _____ to the required size, we _____ it out of the solution.
(to immerse, to grow, shall, to take)

6. By three p.m. the new pump _____ for two hours.
(to work)

7. If the wire _____ of a smaller diameter, its _____ resistance.
(to be, would, to increase)

8. Iron filings _____ most strongly attracted to the poles of the magnet.
(to be)

2. Перекладіть та поясніть усі граматичні явища у реченні:

1. I think I have made a mistake in my calculations.
2. The elongation of the test specimen was measured after its broken ends had been put together.
3. For four years he has been working at his subject.
4. What have you been doing since I saw you last?
5. Even though a power interruption were short, it would cause a process shutdown.

3. Перекладіть та поясніть усі граматичні явища у реченні:

1. A positive particle moving upward may have produced this track.
2. You should have measured the difference in potential between the points X and Y.
3. He was to have made a report on physical properties of solids.
4. If we should add one or more electrons to the outer part of the atom, the atom would have a negative electrical charge.

4. Перекладіть та поясніть усі граматичні явища у реченні:

1. Having been stressed beyond the elastic limit a bar continues to extend while carrying a constant load.

2. Mendeleev found it necessary to alter some atomic weights... in order that the elements should fall into positions in the periodic table assigned to them by their chemical properties.

3. You see, there are a number of experiments that have to be done.

4. The first steam engine was built for the pumping of water out of the mines.

5. Перекладіть текст:

The interaction of the electric current and the magnet.

In 1825 Florentine physicist L. Nobili invented a highly sensitive galvanometer, and in 1827 with the help of this device he was the first to succeed in registering the difference of potentials between the different points of the body of a frog. But, as we have already mentioned, it is simple to experience, but still it's not enough, and what is more important to understand it right.

Nobili is the follower of Volta, and therefore has explained the origin of the registered potentials that one areas of tissues are warmer, than others, as the speed of the evaporation of a liquid from different points cannot be strictly identical. So Nobili has not paid attention to the important discovery. The authority of Volta impeded him the same as the authority of Dzhilberta had impeded Galvani.

Since 1837 another Italian scientist Matteuchi has used galvanometer for the true check-up of experiments of Galvani and his followers.

F, Matteuchi has discovered that between the intact and the damaged areas of a muscle there is a difference of potentials; thus the cut of a muscle always plays the role of a negative pole. The current, flowing to the damaged place, has been named the current of damage. This result of Matteuchi has given the explanation to two first experiments of Galvani, in fact Galvani

supposed that the electric fluid flows between the intact and the damaged areas of a muscle. It's true, that Matteuchi has been only able to register the current of damage of a muscle, but not of a nerve (the sensitiveness of the device was not enough). But if to consider the situation for the damaged nerve, it's clear, that the place of a cut of the nerve served as a source of the current which in the first experiment excited the muscle of a frog, and in the second its nerve.

Matteuchi has discovered that during the excitation of the damaged muscle the current of damage decreased for some reason. It has surprised an experimenter very much. It would seem that at the excitation it must be continuously increasing, but not decreasing!

Finally, Matteuchi has made the third experiment of Galvani widely known. Matteuchi has showed in fact, that at the excitation of an uncrippled muscle an electric current which flows between its parts can excite a lying on it nerve. Works of Matteuchi have carried the principle: while the paw of a frog has served as the measuring device before, there is no confidence that the processes of excitation are related to the electric phenomena.

It could have been taken for granted after the works of Matteuchi. We will remind you that this took place in 1837. It was the year of a century from the day of the birth of Galvani and the year of his posthumous triumph. The rightness of the explanation of his last experiments has been well-proved by Matteuchi. Already in 1841 the complete volume of Galvani's works appeared. Galvani has become famous and this time it's forever.

6. Дайте відповідь на питання:

1. What did Florentine physicist L. Nobili invent in 1825?

2. How has Nobili explained the origin of the registered potentials?
3. What has F, Matteuchi discovered?
4. What was the next stage of Matteuchi's discovery?
5. What experiment has Matteuchi made?

7. Складіть стислий конспект тексту.

Контрольне завдання №4.

Варіант 4.

Граматика:

1. Дієслово (Verb). Дієслова to be, to have. Особові та неособові форми дієслів (Personal non-personal verbs). Правильні та неправильні дієслова (Regular and irregular verbs). Перехідні та неперехідні дієслова (Transient and intransient verbs). Самостійні та допоміжні дієслова (Independent and auxiliary verbs). Модальні дієслова (Modal verbs– should, would). Дієслова-зв'язки. Спосіб дієслів (Mood). Стан дієслів (Voice) - Active and Passive Voice. Вид та число дієслів (Person and number). Час дієслів – Perfect Tenses - Теперішній досконалий час (Present Perfect Tense) Минулий досконалий час (Past Perfect Tense) та Майбутній досконалий час (Future Perfect Tense). Майбутній досконалий час у минулому. (Future Perfect Tense in the Past). Теперішній досконалий тривалий час (Present Perfect Continuous/Progressive Tense), минулий досконалий тривалий час (Past Perfect Continuous/Progressive Tense) та Майбутній досконалий тривалий час (Future Perfect Continuous/Progressive Tense) Узгодження часу (Sequence of tenses). Наказовий спосіб (The Imperative Mood). Умовний спосіб (The Subjunctive Mood).

Завдання:

1. Перекладіть та поставте в усіх реченнях правильні граматичні форми:

1. By the middle of the nineteenth century about sixty different elements ______. (to be discovered)
2. The Curie _____ for four years before they _____ radium. (to be working, to discover)
3. The new pump _____ already _____ for two hours when we _____ it for examination. (to work, to stop)
4. The name of Neptunium _____ to the new chemical element №93. (to be given)
5. Though there _____ vacant places in the periodic table, Mendeleev _____ the properties of the missing elements. (to be, to predict)
6. The control mechanism _____ quite simply _____. (to be made)
7. Who _____ this law _____ by? (to discover)
8. Though there _____ vacant places in the periodic table, Mendeleev _____ the properties of the missing elements. (to be, to predict)

2. Перекладіть та поясніть усі граматичні явища у реченні:

1. He had made many experiments before he published the results of his work.
2. If the molecules of water had been divided into smaller parts, it would not have been water any longer but some other substance.
3. It has long been known that lightning is nothing else but an electric spark.
4. Were a drop of water magnified to the size of the earth, the molecules composing it would be about the size of oranges.
5. Lomonosov worked in many fields of science and everywhere he brought something new and original leaving his century far behind.

3. Перекладіть та поясніть усі граматичні явища у реченні:

1. We know of Curies' having obtained radioactive elements.
2. I seem to have promised that I'd take you into my laboratory.
3. On account of friction we always get less useful work out of a machine than it could have given.

4. Перекладіть та поясніть усі граматичні явища у реченні:

1. Maybe you happened to observe what great labour is connected with forging, stamping and rolling.
2. In consequence of heating the length of the bar increased.
3. A large proportion of radium is likely to be lost from sea water.

5. Перекладіть текст:

Discovery of the thermal action of current

Of all thermal effects, that are produced with the current of a battery, the most evident, no doubt, has been an arc between two coal conductors. Already in 1802 Kurte noticed that in the moment of shorting of a chain of the battery with a ferrous conductor, contiguous with a piece of charcoal, sparks appeared so bright, that they lighted up surrounding objects. After a few years John Children {1778—1852} has discovered that some pieces of coal, placed in a chain had «diffused such a bright light, that even the radiance of the sun seemed dark compared to it».

But the true showy phenomenon displayed Davy in 1810 with the help of a large battery, consisting of 2000 elements and constructed by him on the means of the Royal institute. Besides the different experiments on rapid incandescence and melting of metals, which he has struck the public on his first lecture, given after construction of this huge battery, Davy has also conducted the experiment with the pieces of coal as long as an inch and as thick as the sixth of the inch, plugged in the chain of the battery. After the chain was closed, the brightest spark and the pieces of coal got white-hot

more than on half of the length, «...when both pieces of coal began to delete from each other, a continuous charge appeared via burning of a hot air in the distance of at least four inches as an unusually bright wide light arc, peg-shaped and turned bulging upwards».

Davy has checked up at once, as far as the temperature of this arc which melted platinum is high, «as though it was a bees-wax in the flame of a candle». The length of the arc could have been increased, being placed under the hubcap of pneumatic machine with a rarefying air, and if the rarity were strong enough, it had succeeded to get the arc of very showy purple color as long as six or seven inches.

It is clear, that the experiment of Davy, which a powerful battery was required for, was uneasily to repeat. Therefore, ten years after July of 1820, de la Riv succeeded to repeat this experiment in the face of scientists of the Genevan Scientific Society, it had showed itself a thing so new, that up today some historians were ascribing this discovery to the Genevan physicist.

If the experiment with an arc is striking with its showiness, then the other thermal phenomena seem very tangled. So, having carried out on the advice of Wollaston an experiment with the two platinum wires, Children (1815) discovered that out of two platinum wires of the identical length, but different diameter, connected to the chain consistently, only thinner was hot, while at the parallel connection was hot only more thick. Davy (1821), heating with a lamp reflector a part of chain, was striving for diminishing the temperature of the other of its part, and cooling it with ice, got the increase of the temperature of the other part.

Up to 1841 all the attempts to explain these and many other strange phenomena have appeared helpless, but the opinion grew more and more,

that the heating of conductors was related to the resistance which had been rendered to passing through them current, so that a greater apportionment of heat corresponded to a greater resistance. This opinion has been expressed by Kinnersli concerning the heat, apportioned with the charge of the Leyden jar. Considering the experiments mentioned above, Davy went farther, asserting that «...conductive ability of metals changes with the change of the temperature and diminishes in that relation, when the temperature grows in».

6. Дайте відповідь на питання:

1. What has been the most evident of all thermal effects?
2. What showy phenomenon did Davy display in 1810?
3. What experiment did Children carry out in 1815?
4. What was Davy striving for in 1821?
5. What did Davy assert considering the experiments?

7. Складіть стислий конспект тексту.

Контрольне завдання №4.

Варіант 5.

Граматика:

1. Дієслово (Verb). Дієслова to be, to have. Особові та неособові форми дієслів (Personal non-personal verbs). Правильні та неправильні дієслова (Regular and irregular verbs). Перехідні та неперехідні дієслова (Transient and intransient verbs). Самостійні та допоміжні дієслова (Independent and auxiliary verbs). Модальні дієслова (Modal verbs– should, would). Дієслова-зв'язки. Спосіб дієслів (Mood). Стан дієслів (Voice) - Active and Passive Voice. Вид та число дієслів (Person and number). Час дієслів - Perfect

Tenses – Теперішній досконалий час (Present Perfect Tense) Минулий досконалий час (Past Perfect Tense) та Майбутній досконалий час (Future Perfect Tense). Майбутній досконалий час у минулому. (Future Perfect Tense in the Past). Теперішній досконалий тривалий час (Present Perfect Continuous/Progressive Tense), минулий досконалий тривалий час (Past Perfect Continuous/Progressive Tense) та Майбутній досконалий тривалий час (Future Perfect Continuous/Progressive Tense) Узгодження часу (Sequence of tenses). Наказовий спосіб (The Imperative Mood). Умовний спосіб (The Subjunctive Mood).

Завдання:

1. Перекладіть та поставте в усіх реченнях правильні граматичні форми:

1. If a body _____ from one position to another it _____
_____ a displacement. (to move, to be said, to have)
2. The Periodic Table _____ of uppermost importance in _____
a number of problems in connection with industrial research. (to be, to solve)
3. How long _____ it _____ since you _____ in a laboratory?
(to be, to be)
4. We _____ that when a piece of lead _____ with a hammer, the
lead in the spot _____ and _____ denser. (to notice, to be struck, to
contract, to become)
5. He _____ that we should decrease the intensity of the current.
(to suggest)
6. A copper wire _____ red-hot because an electric current _____
_____ through it. (to become, to be passed)
7. He _____ that we _____ the intensity of the current.
(to suggest, should, to decrease)
8. I _____ that I'd take you into my laboratory.
(to seem, to promise)

2. Перекладіть та поясніть усі граматичні явища у реченні:

1. Before the new machine is stopped tomorrow morning, it will have been working for three hours.
2. Thus it was stated that Lomonosov discovered a number of scientific laws of world importance as early as in the 18th century.
3. For simplicity the truss is pictured as though it were a beam.
4. Were the wire of smaller diameter, its resistance would be increased.
5. The Curie had been working for four years before they discovered radium.

3. Перекладіть та поясніть усі граматичні явища у реченні:

1. I seem to have promised you that I'd take you in my lab.
2. Only after having applied force we could change the volume and the form of a solid body.
3. Further experiments showed that cathode rays travelled in straight lines, could be deflected by a magnet and heated objects placed in their path.
4. If the lens were absent, the eye could not see AB distinctly until it was removed to ab.

4. Перекладіть та поясніть усі граматичні явища у реченні:

1. Having broken the magnet into pieces, we get complete magnets.
2. Roentgen suggested that the rays characterized by great penetrating power should be called X-rays.
3. Polzunov's engine was the first steam engine to be used instead of water wheels.

5. Перекладіть текст:

An electrostatic machine and new properties of electricity

In 1650 well-known inventor of air-pump burgomaster Otto von Gerike from Magdeburg (1602—1686) made a ball from sulphur in a size of a child's head, planted it on a ferrous axis and fixed on a wooden stick. With the help of a

ball it can be revolved and rubbed with the hands or a piece of smooth woolen cloth, pinned against a ball with the hand. This is the simplest electrostatic machine.

Gerike has succeeded to notice a weak luminescence of the electrified ball in the darkness and, what is especially important, first to discover that the bits of fluff, that are attracted by the ball, after a while are pushed off from it. That phenomenon neither Gerike nor many of his contemporaries could explain for a long time. From a letter of well-known German scientist In. Leybnits, (1646—1716) Gerike (March, 1672) got to know, that Leybnits, using his machine, had been looking after an electric spark and this was the first mention about this enigmatic phenomenon.

During the first half of XVIII century an electrostatic machine was subject to a number of improvements: a ball from sulphur was transferred to a glass one, because the glass was more intensively electrified, and later instead of balls or cylinders (which were more difficult to make and at heating they burst out quite often), began to apply glass disks. For rubbing leather pillows, pinned against the glass springs were used. Later for strengthening of the electrization of pillows, they were started to cover with an amalgam.

The new important element of a machine-device became a conductor (1744) that is a tube, suspended on silk strings, and later placed on insulating supports. A conductor is serving as a reservoir for collection of electric charges, formed at a friction. After the invention of the Leyden jar they were also set next to a machine-device.

In 60th XVIII century an electrostatic machine gained main modern characteristics. Very original, simple and reliable electrostatic machines have been described in an article of well-known Russian scientific encyclopedist Andrey Timothy Bolotov (1738—1833) «Made as a result of experiment he remarks about electricism, having ability to help electric cumbersome objects from different illnesses» (SPB, 1803). He has also created even room

«well-knit» and «travelling» machines with the diameter of a glass ball of about 20 cm.

Trying to get the most effect, some inventors have constructed the machines of enormous sizes: for example, the electrostatic machine with the diameter of disk of 2 mc. 27 cm. is kept in London, thus the rotation of it was carried out by a steam-engine (1849).

Various experiments with electrostatic machines and progress in the sphere of natural science have caused a considerable interest to electric and to magnetic phenomena and have resulted in the earlier unknown facts. Two kinds of electricity and the laws of their co-existence have been discovered, and the «quickness of transmission of electricity was set».

New electric devices, allowing to get and accumulate electricity in great amounts and also to measure the intensity, have been created. The study of atmospheric electricity has been started, the first theories of the electric phenomena have been developed.

A considerable step in the study of properties of electric charges has been made by member of English Royal Society Stephen Grey (1670—1736) and member of Academy of Sciences Charles Francois Dyufe (1698—1739).

As a result of numerous experiments S. Grey, has succeeded in discovering that «electric ability of glass tube to attract bodies can be passed to other bodies», and to show (1729) that the bodies depending on their attitude toward electricity are possible to divide into two groups: conductors (for example, a metallic wire) and non-conductors (a silk filament).

Continuing experiments of P. Warming, Sh. F. Dyufe (in 1733—1737) found out two sorts of electricity — «glass», «resin» and their feature to push away the same charges and attract the opposite. Dyufe has also created the

prototype of an electroscope as two suspended filaments, going away during their electrization.

6. Дайте відповідь на питання:

1. What did the well-known inventor of air-pump burgomaster Otto von Gerike from Magdeburg make in 1650?
2. What has Gerike succeeded to notice?
3. How was an electrostatic machine subject to a number of improvements in XVIII century?
4. What was the new important element of a machine-device in 1744?
5. What were further attempts to improve the electrostatic machine?

7. Складіть стислий конспект тексту.

НАВЧАЛЬНЕ ВИДАННЯ

Методичні вказівки

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(англійська мова)**

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