МИНИСТЕРСТВО НАУКИ И ВЫСШЕГО ОБРАЗОВАНИЯ РОССИЙСКОЙ ФЕДЕРАЦИИ

Федеральное государственное бюджетное образовательное учреждение высшего образования
«Воронежский государственный технический университет»

Строительно-политехнический колледж

МЕТОДИЧЕСКИЕ УКАЗАНИЯ

для практических занятий и организации самостоятельной работы по дисциплинам "Иностранный язык" и "Иностранный язык в профессиональной деятельности" для студентов специальностей 12.02.10 Монтаж, техническое обслуживание и ремонт биотехнических и медицинских аппаратов и систем, 12.02.06 Биотехнические и медицинские аппараты и системы

Методические указания обсуждены на заседании методического совета СПК

«18» 02. 2022 года Протокол № 6

Председатель методического совета СПК_____ Сергеева С. И.

Методические указания одобрены на заседании педагогического совета СПК

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Методические указания к учебному материалу на английском языке для проведения практических занятий и организации самостоятельной работы по дисциплинам Иностранный язык и Иностранный язык в профессиональной деятельности для студентов специальностей 12.02.06 Биотехнические и медицинские аппараты и системы, 12.02.10 Монтаж, техническое обслуживание и ремонт биотехнических и медицинских аппаратов и систем очной формы обучения / ГОУВПО «Воронежский государственный технический университет»; сост. Ю.В. Малютина, И.В. Полухина, 2022. 54 с.

Методические указания содержат учебные тексты и задания для аудиторной работы. Они предназначены для развития навыков чтения, реферирования и аннотирования литературы по специальности, а также для развития навыков говорения и расширения терминологической лексики. Задания содержат упражнения на усвоение лексических единиц по специальности и развитие навыков говорения.

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ТЕМА 3.2 ЭЛЕКТРОННАЯ ЭМИССИЯ

ELECTRON EMISSION

depend – зависит
carrier – носитель переносчик (энергии)
ordinary – обычный
surface – поверхность
substance - пределы
attract - притягивать
except - исключать
sufficient - достаточный
external - внешний
thermionic – термоэлектронный

The electron tube depends for its action on a stream of electrons that act as current carriers. To produce this stream of electrons a special metal electrode (cathode) is present in every tube. But at ordinary room temperatures the free electrons in the cathode cannot leave its surface because of certain restraining forces that act as a barrier. These attractive surface forces tend to keep the electrons within the cathode substance, except for a small portion that happens to have sufficient kinetic energy (energy of motion) to break through the barrier. The majority of electrons move too slowly for this to happen.

To escape from the surface of the material the electrons must perform a certain amount of work to overcome the restraining surface forces. To do this work the electrons must have sufficient energy imparted to them from some external source of energy, since their own kinetic energy is inadequate. There are four principal methods of obtaining electron emission from the surface of the material: thermionic emission, photoelectric emission, field emission and secondary emission.

Thermionic emission. It is the most important and one most commonly used in electron tubes. In this method the metal is heated, resulting in increased thermal or kinetic energy of the unbound electrons. Thus, a greater number of electrons will attain sufficient speed and energy to escape from the surface of the emitter. The number of electrons released per unit area of an emitting surface is related to the absolute temperature of the cathode and a quantity of the work an electron must perform when escaping from the emitting surface.

The thermionic emission is obtained by heating the cathode electrically. This may be produced in two ways: 1. by using the electrons emitted from the heating spiral for the conduction of. current (direct heating) or 2. by arranging the heating spiral in a nickel cylinder coated with barium oxide which emits the electrons (indirect heating). Normally, the method of indirect heating is used.

Photoelectric emission. In this process the energy of the light radiation falling upon the metal surface is transferred to the free electrons within the metal and speeds them up sufficiently to enable them to leave the surface.

Field or cold-cathode emission. The application of a strong electric field (i.e. a high positive voltage outside the cathode surface) will literally pull the electrons out of the material surface, because of the attraction of the positive field. The stronger the field, the greater the field emission from the cold emitter surface.

Secondary emission. When high-speed electrons suddenly strike a metallic surface they give up their kinetic energy to the electrons and atoms which they strike. Some of the bombarding electrons collide directly with free electrons on the metal surface and may knock them out from the surface. The electrons freed in this way are known as secondary emission electrons, since the primary electrons from some other source must be available to bombard the secondary electron-emitting surface.

EXERCISES

I. Review questions:

1. What does the action of the electron tube depend on?
2. What is present in every tube to produce the stream of electrons?
3. At what temperatures free electrons cannot leave their surface of the cathode?
4. What forces tend to keep the electrons within the cathode substance?
5. What must the electrons do to escape?
6. What must the electrons have to overcome the restraining surface forces?
7. How many methods are there for obtaining electron emission?
8. What are they?
9. What imparts the external energy to the electrons in thermionic emission?
10. What energy is used for producing free electrons in photoelectric emission?
11. What is field emission?
12. How is secondary emission obtained?
13. What emission is the most commonly used in electronics?

II. Make up an abstract of the text basing on the answers to the above questions.

III. Translate *the international words without a dictionary.*
cathode, emitter, material, cylinder, portion, energy, radiation, temperature, thermal, adequate, absolute, special, emission, electron, normally

IV. Define to what parts of speech these words belong and translate them:

realize, equalize, electrify, classify, originate, strengthen, widen, increasingly, widely, likewise, otherwise, forward, towards, upward, outward, downward

V. Translate these antonyms and memorize them:

1. be present *(v),* be absent
2. primary *{ad}),* secondary
3. relative *(adj),* absolute
4. outside *(adj),* inside
5. majority *(n)* minority
6. common *(adj),* special
7. external *(adj),* internal
8. slow *(adj),* quick, rapid
9. free *(adj),* bound
10. strong *(adj),* weak

VI. Translate these words and word combinations and learn them:

because of, since, except for, a number of, the same, within, in this way, suddenly, sufficiently, literally

ТЕМА 3.3 ХАРАКТЕРИСТИКА ДИОДА

DIODE CHARACTERISTICS

1. The relation between the plate current in a diode and the plate-to-cathode voltage just discussed can be represented by a characteristic curve, obtained by plotting the plate-current I_a values for different values of the applied plate voltage E_a.

2. The diode the characteristic of which is to be determined is connected in circuit in the manner shown in Fig. 1. Heating voltage and heating current are kept constant while the tube characteristic is being obtained. Plate current is being increased by steps by adjusting the variable resistor R_a connected in the same way as a potential divider. The anode current and voltage are indicated.

3. The diode characteristics for a typical diode tube and various cathode operating temperatures are shown in Fig. 2. It is seen from Fig. 2 that all the curves are the same at low plate voltages, where the negative space charge is most effective in limiting the flow of electrons. The plate current - in the low plate-voltage region is completely controlled by the voltage at the plate and is independent of the cathode temperature. Under these conditions the plate current is said to be space-charge limited.

4. As the plate voltage is made progressively higher, an increasingly greater portion of the total supply of emitted electrons are attracted to the plate and the effect of the space charge is eventually completely overcome. This is seen by the flattening of the characteristic curves, as the plate voltage is increased. When the entire supply of emitted electrons at a given cathode temperature is attracted to the plate, the plate current becomes independent of the plate voltage and reaches a constant value equal to the total emission current. Emission saturation takes place and the plate current is said to be emission-limited in the high plate-voltage region.[1] The foregoing has already made it clear that the principal advantage of the diode tube is that it permits the flow of current in one direction only, that is from the cathode to the anode. For this reason diode tubes are often used as rectifiers to change alternating current to direct current.

Commentary

1. Emission saturation takes place and the plate current is said to be emission-limited in the high plate-voltage region. — Происходит эмиссионное насыщение и считается, что анодный ток достигает насыщения в области высоких напряжений

EXERCISES

I. *Review questions:*

1. What does a diode characteristic show? 2. What is kept constant while the tube characteristic is being obtained? 3. What controls the

plate current in the low plate-voltage region? 4. What is independent of the cathode temperature? 5. Under what conditions is the plate current said to be space-charge limited? 6. When does the emission saturation take place? 7. Why are the diode tubes used as rectifiers? 8. What current do they rectify?

II. *Make up an abstract of the text basing on the answers to the above questions.*

III. *Translate the international words without a dictionary:* anode, diode, effect, characteristic, constant, total

ТЕМА 3.4. ОСЦИЛЛОГРАФ

Cathode-Ray Tubes

Cathode-ray tubes are widely used in various branches of radio engineering such as oscillography, radiolocation, television, etc. In the narrow part of the tube the cathode K, focussing system and beam-deflecting system are mounted. Deposited on the inner surface of the glass face-plate is a luminescent screen S. The cathode is of the indirectly heated oxide-coated type, it is fabricated in the form of a cylinder with the oxide coating on its end cap. The cathode is mounted inside a control electrode (modulator) CE in which an aperture is provided. The brightness of the spot on the tube screen can be varied by changing the negative potential on the control electrode with respect to the cathode thus changing the electron-beam current.

Moving along the tube axis after passing the control electrode is the electron stream which encounters two anodes A_1 and A_2, both of which are cylindrical in shape. The accelerating field provided by the two anodes ensures the motion of electrons towards the screen and simultaneously focusses the stream into a narrow beam.

Electron beam focussing can be accomplished with the aid of either an electric or magnetic field. In the first case focussing is

termed electrostatic and takes place in the electric field between A_1 and A_2. An electron E moving at some angle to the device axis is deflected by the electric field set up between the anodes. Proper selection of the voltage difference on these electrodes ensures focussing of the beam on one spot on the tube screen.

Magnetic beam focussing is achieved by a focussing coil mounted into the tube neck. Deflection of the electron beam is accompanied in the same manner as focussing that is either by an electric field or by a magnetic field. The electrostatic system of beam deflection consists of two pairs of vertical and horizontal deflecting plates. An electron passing between two parallel plates to which a certain voltage is applied, it will be deflected towards the positively charged plate. There being two pairs of mutually normal plates, the electron beam can be deflected in horizontal and vertical planes.

Magnetic field deflection is accomplished by two pairs of deflecting coils mounted into the tube neck at right angles to each other. The greater the magnetic-field intensity H and the lower the voltage V which accelerates the electrons, the greater is the beam deflection. The tube screen is a semitransparent thin layer of a luminous substance.

Most cathode-ray tubes are oscilloscopes used to display rapidly changing voltages and currents.

EXERCISES

I. Find in the text synonyms for the following words:
different, to produce, to supply, relative to, at once, to occur, to get, speed, to use.

II. Translate the following expressions. Use them in sentences of your own: with respect to, either ,in the same manner, at right angles, simultaneously.

III. Translate the following terms:
cathode-ray tubes, the focussing system, beam-deflecting systems. Luminescent screens, the control electrode, the electron beam current,

the electron stream, the electron beam focussing, the magnetic beam focussing, the magnetic field deflection, the magnetic field intensity, the beam deflection, the horizontal deflecting plates.

IV. Translate into English:

Электронно-лучевые трубки широко используются в различных отраслях радиотехники. По своей конструкции ЭЛТ состоит из катода К, системы фокусировки электронного потока и отклоняющей системы. Изменяя отрицательный потенциал управляющего электрода относительно катода, можно регулировать величину электронного потока и таким образом менять яркость светового пятна на экране.

Фокусировка электронного потока в узкий луч осуществляется с помощью электрического или магнитного поля.

V. Put questions to the text.

VI. Retell the text according to the following plan:

a) The CRT, its construction and application; b) The adjustment of the electron stream; c) Electron stream focussing into a narrow beam; d) Magnetic and electrostatic beam deflection.

VII. Explain the principle of a cathode-ray tube operation.

VIII. Write a summary of the text.

ТЕМА 3.5. ЭЛЕКТРОПРОВОДИМОСТЬ

CONDUCTIVITY

- Today we shall speak about classifying materials according to their electrical properties.

There are many ways of classifying materials. The one we shall speak about is based on the ability of

a material to conduct electricity. But first, answer my question: do only electrons take part in conductivity?

- No, not only electrons. Other charged particles also take part in conductivity. Therefore one can say that conductivity is the result of the motion of charged particles.
— Does the ability of the — material to conduct current depend on the number of charged particles inside the material?
—Yes, it is directly proportional to the number of charged particles inside the material that can be set in motion.
— Am I right to say that not all electrons, but only free electrons take part in conductivity?
— Quite right. Metals, for example, having many free electrons, can readily conduct current at room temperature such materials are called conductors. I can add that there are materials which have very few (or no) free electrons. They are called insulators.
— And what do you know -about selenium, silicon and germanium?
— These are semiconductors.
— They have more free electrons than insulators, but fewer than conductors.
— Does the conductivity of — metals depend on temperature?
— Yes, the higher the temperature, the lower the conductivity.
— Is there the same dependence in semiconductors?
— No, in semiconductors the — conductivity increases, if the temperature rises, but within certain limits.

ability - способность
according to -на основании, согласно чему-л.
add -дополнять, добавлять
addition- дополнение
in addition to -к тому же, кроме того
also - также
base *v* -основывать
basic -основной
certain- определенный

charge *n, v*- заряд; заряжать
consider- рассматривать
consideration - рассмотрение
easy -нетрудный, легкий
explain - объяснять
explanation - объяснение
few -мало (с исчисляемыми существительными)
a few - несколько
free- свободный
germanium - германий
high - высокий
limit *n, v* -предел; ограничивать
limitless- беспредельный
low- низкий
move *v*- двигаться
motion - движение
number -число
a number of -ряд, несколько
particle- частица
property -свойство
silicon - кремний
such -такой
such as -такой как
take part in (took; taken)- принимать участие в
therefore -поэтому
way -способ

I. Translate without a dictionary.
1. Materials *can be classified* according to their electrical properties. 2. This method *is based* on the ability of a material to conduct electricity. 3. What materials *are called* conductors? 4. The materials that have very few or no free electrons *are called* insulators. 5. Electronics *is defined* in an English dictionary as "the study of

conduction of electricity in a vacuum, in gases and in semiconductors". 6. When the cathode *is heated,* it emits electrons. 7. The electrons *are repelled* toward the plate by the negative voltage on the cathode. 8. The electrons *are attracted* by the positive voltage on the plate. 9. If a negative voltage *is applied* to the plate, current does not flow.

II. Translate into Russian:

There are many ways of classifying materials. The one we shall speak about is based on the ability of a material to conduct electricity,—Существует много способов классификации материалов. Тот (способ), о котором мы будем говорить, основан на способности материала проводить электричество.

1. There are many types of robots; the ones,-we are going (собираться) to discuss today, are the robots of the 3rd generation (поколение).

2. The new computer is more powerful than the one put into service last year.

3. That semiconductor device is more efficient than the one under consideration.

ТЕМА 3.6. МАТЕРИЯ, ЭЛЕМЕНТЫ И АТОМЫ

1. Переведите текст без словаря и скажите, какие дополнительные данные о проводниках и изоляторах содержатся в этом тексте.

Classifying Materials

There are many ways of classifying materials. The one we shall use here is based on the ability of a material to conduct electricity. It is known that conduction takes place as a result of the motion of charged particles, usually electrons. The ability of any material to conduct electricity is directly proportional to the number of charged particles inside the material that can be set in motion. Materials (for example

metals), that have relatively large numbers of free electrons, readily conduct electric current and are called conductors. Other materials having very few (or no) free electrons do not readily conduct electric current under normal conditions (условие) and are called insulators. It should be realised [1] that the terms (термин) 'conductor' and 'insulator' are not absolute, that is[2] some conductors do not conduct as well as other conductors, while (в то время как) some insulators do not insulate as well as other insulators.

ПРИМЕЧАНИЯ

[1] it should be realised — следует учесть

[2] that is — то есть

2. Подберите к русским словам соответствующие английские эквиваленты. Обратите внимание на то, что группы А, Б, В иллюстрируют некоторые виды перевода английских глагольных форм, оканчивающихся на '-ing'

А. 1. увеличивающий; 2. имеющий; 3. происходящий; 4. сравнивающий; 5. показывающий; 6. работающий; 7. описывающий

1. comparing; 2. describing; 3. having; 4. occurring; 5. operating; 6. showing; 7. increasing

Б. 1. давая в результате; 2. используя; 3. управляя; 4. доказывая; 5. давая; 6. называя; 7. уменьшая

1. proving; 2. calling; 3. giving; 4. controlling; 5. decreasing; 6. using; 7. resulting in

В. 1. программирование; 2. классификация; 3. нагревание; 4. изготовление; 5. кондиционирование; 6. анализ; 7. электрополирование

1. heating; 2. electropolishing; 3. analysing; 4. programming; 5. conditioning; 6. making; 7. classifying

3. Подберите к русским предложениям соответствующий перевод.

А. Они заряжают. ..— 1. They are charging. ..; 2. They were charging. ..; 3. They will be charging. ..
Б. Это происходило. ..— 1. This is taking place. ..; 2. This was taking place. ..; 3. This will be taking place..,
В. Вода текла. ..— 1. The water is flowing. ..; 2. The water will be flowing. ..; 3. The water was flowing. ..
Г. Ток будет проходить. ..— 1. The current is passing. ..; 2. The current will be passing.,..; 3. The current was passing. ..
4. Подберите к английским предложениям соответствующий перевод, обращая особое внимание на 'ing-форму'.

1. Our laboratory is now developing a new semiconductor device.
2. Developing a new semiconductor device our laboratory had to solve many problems.
3. The laboratory developing a new semiconductor device has to solve many problems.

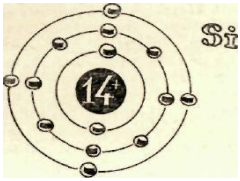
a. Лаборатория, разрабатывающая новое полупроводниковое устройство, должна решить многие проблемы.
b. Разрабатывая новое полупроводниковое устройство, наша лаборатория должна была решить многие проблемы.
c. Наша лаборатория сейчас разрабатывает новое полупроводниковое устройство.

5. *Заполните пропуски соответствующими по смыслу словами.*
1. Electrons flow from the ... to the ... in a vacuum-tube diode. 2. When heated a cathode ... electrons. 3. A three-element tube is called a ... . 4. The elements of a triode are called ..., ..., and ... . 5. The

process of converting an alternating current (AC) to direct current (DC) is called ... .

6. Переведите английский текст, обращая внимание на выделенные слова и словосочетания

MATTER, ELEMENTS AND ATOMS



—Before speaking about the atomic structure I must say that matter consists of one or more elements. Elements are substances that cannot be divided into other substances.

— And I shall give the definition of an atom. An atom is the smallest particle of an element, which has all the properties of the element and can take part in chemical reactions.

— What particles are there in an atom?

— In each atom there is a nucleus, containing a number of protons (each proton has a positive electrical charge) and a number of neutrons, having no electrical charge. The nucleus is surrounded by a number of electrons. Each electron has a negative electrical charge. The electrons orbit around the nucleus.

— How many protons are there in the nucleus? An atom has as many — protons as it have electrons. This results in a zero electrical charge of the atom.

— Could you add anything — about electrons?

— They orbit around the nucleus in several possible orbits. These orbits are called shells. I am sure you know the structure of a silicon atom, don't you?

- Yes, I do. There are fourteen protons in the nucleus of a silicon atom. Fourteen electrons orbit around the nucleus in three orbits. The first or inner shell contains two electrons and cannot hold any more electrons. In the second shell there are eight electrons. It cannot hold additional electrons either.

In the third shell, which is farthest away from the nucleus, there are only four electrons. This outer shell can hold more electrons. I remember that the outer shell of any atom is called its valence shell.
Yes. I shall add that the number of electrons in the valence shell is known as the valency of the atom.

ТЕМА 3.7. ТРАНЗИСТОРЫ И ПОЛУПРОВОДНИКИ

SEMICONDUCTORS

Semiconductors are solids whose resistivity lies between those *of* electrical conductors and insulators. Semiconductors are used in computers, in radio and TV receivers, and in other electronic products.

Semiconductor devices perform many control functions. They may be used as rectifiers, amplifiers, detectors, oscillators and switching elements. Some characteristics, which make the semiconductors such an attractive member of the electronics family, are as follows:

1. Semiconductors are small and light in weight.

2. Semiconductors are solids. There is therefore little chance that elements will vibrate. Element vibration in vacuum tubes was the cause of microphonics.

3. Semiconductors require little power and radiate less heat than tubes. They do not need warm up time and operate as soon as power is applied.

4. Semiconductors do not undergo (подвергаться) the chemical deterioration (порча) which occurs in tube cathodes. The deterioration of tube cathodes eventually results in unacceptable tube performance.

Silicon is the material of which most semiconductor devices are presently constructed.

THE TRANSISTOR

Scientific interest in semiconductors led to the development of the transistor. One advantage of the transistor is that it is small and

light, permitting miniaturization of electronic equipment. The transistor operates with low voltages and uses little power. It does not require any warm up period and operates as soon as power is applied. A transistor has fewer circuit connections. A disadvantage of transistors is their sensitivity to heat, but an advantage is that they do not generate much heat.

There are many types of transistors. These *(зд.* они) may be classified according to the basic material from which they are formed. In this category we find germanium and silicon transistors. Most transistors are now made of silicon. Transistors may be classified also according to the process by which they are constructed. Here we find various types of junction transistors and point-contact transistors.

Transistors may also be classified according to the number of elements. Thus there are the triodes, or three-element transistor, and the tetrode, or four-element transistor. They may also be classified according to their ability to dissipate (рассеивать) power. Here we find a wide range from the low-power (less than 50 mW) to the high-power (2 W and higher) type.

Transistors come in different shapes and sizes. There are variations also in the manner of mounting the transistor in the circuit.

EXERCISES

I. *Review questions:*
1. What is a transistor?
2. What do transistors replace?
3. What are two most frequently used varieties of semiconductors?
4. What structure do germanium and silicon have?
5. Why is a pure germanium crystal practically called a non-conductor?
6. When do the current-conducting characteristics of the germanium crystal change?
7. What procedure is known as doping?

8. What is type germanium?
9. What is an acceptor atom?
10. What is type germanium?

II. *Make up an abstract of the text basing on the answers to the above questions.*
III. *Translate the international words without a dictionary:* situation; procedure, variety, popular, neutral, crystalline, mobile, equivalent, trivalent, real, practically, radically
IV. *Translate these synonyms and memorize them:*
1. free *(adj),* loose
2. often *(adv),* frequently
3. substantial *(adj),* essential
4. instant *(n),* moment
5. pair *(n),* couple, two
6. disrupt *(v),* break
7. procedure *(n),* process
8. create *(v),* build up
9. radically *(adv),* completely, entirely 10. variety *(n),* kind, change, difference
V. *Translate these verbs and learn them:*
to replace, to rely, to introduce, to travel, to enter, to behave, to cancel, to associate, to liberate, to permit

ТЕМА 3.8. ТЕЛЕВИДЕНИЕ
Television

It is true that an important thing can have a small beginning. Л tiny nine-by-twelve inch box was the centre of attention for hundreds of people at the 1939 World's Fair in New York. They were the first to see a television set in action. *Compared* to today's TV shows of underwater and outer space *research,* those first black-white pictures were not very good. The pictures were only *transmitted* from one side

of the Fair territory to the other. But in 1939 they were of historical importance.

Within a few days the news of television spread throughout the world. A lot of people wanted *to have a look at* the new invention. Everyone was interested in it. But only few people owned television sets in the next few years. When World War II *broke out* electronic factories that began the TV production stopped making them and started making war materials instead. When the war was over, TV sets began coming off factory assembly lines. By 1958 there were millions of them.

In a surprisingly short time people watched fewer films and turned from newspapers and magazines to TV. In its short history television has had great *influence* on people's life and way of thinking. Rocket-launching, concerts and football and tennis matches can be seen as they *occur*. The boundaries of time and space have disappeared.

At present TV communication is provided with the help of a system of *artificial earth satellites* so that people living in different parts of the country and all over the world and in different time zones *are able to* watch the central TV programs at the most *convenient* hours.

Nowadays many countries also have cable TV, a system using wires for the transmission of television programs (like telephone calls). Cable television first *appeared* in 1949 as a *means* of transmitting TV signals to rural and mountain areas far from big cities. Cable television's next big step forward was made by the mid - 1980s. Scientists announced that many technical problems had been solved and in the future it would be possible via satellite and cable TV to use more channels on a TV set at every home in the world.

Then we saw how a new technical invention, colour television, was *rapidly* replacing black-and-white television. Recently it was reported that the first *pocket-size* colour television set had been developed. It was *stated* that a *liquid-crystal display* was used similar

to those on calculators and watches and that it *weighed* less than a pound.

A few years ago it became evident that the next major advance for TV would be digital television. In a digital system the usual *continuous* signal is replaced by a digital code *containing* detailed information on brightness, colour, etc. A digital TV set hangs on the wall like a picture. *Essentially,* it is a minicomputer with a visual display. *Once a week* you put the programs you likelnto the memory, and TV set will automatically *switch on* the desired channel at the right time. You can watch several programs *simultaneously* on miniscreens and then produce one of them in full format. Also, the TV set can automatically video-record the programs when you are absent or *occupied.*

By the end of 1980s television has moved to a new and the most important stage in its development since the appearance of colour television. Technically it is called *high-definition television (HDTV)* or Fli-Vision. This is a television of the 21-st century. This revolution was started by Japanese manufacturers when they developed a new video system with a picture resembling a wide-screen film more than traditional television. The new system doubles the number of lines, as well as increases the screen's width-to-height ratio. The result is a picture five times shaper than in the existing TV sets. This revolutionary system was used during the Seoul Summer Olympics. Since 1990 a new communication satellite has begun to offer regular Hi-Vision service direct to tiny antennae on houses' roofs. By the year 2000 HDTV *equipment* will likely find its application not only in homes, but also in industry, medicine, even film production.

Упражнение 1. Укажите, какие из следующих утверждений соответствуют содержанию текста.

1. A lot of people owned television sets in the first years after its invention.
2. First television black-and-white pictures were excellent.

3. But only few people owned television sets in the next few years after their appearance.
4. Black-and-white television was rapidly replacing colour television.
5. First television black-and-white pictures were not very good.
6. Only a few years ago colour television was rapidly replacing black-and-white television.
7. When the war was over, TV sets stopped coming off factory assembly lines.
8. After World War II TV sets began coming off factory assembly lines.

Упражнение 2. Прочитайте следующие словосочетания и слова из текста и постарайтесь догадаться о значении выделенных слов в данном контексте.

A) 1. TV sets began coming off factory assembly lines
2. on people's life and way of thinking
3. it weighed less than a pound
4. the desired channel
5. when you are occupied

B) *Подберите к каждому слову или словосочетанию соответствующее данному контексту значение*

- unit of weight
- programme
- busy with smth.
- where parts of large machines are put together in mass production
- the way you think

Упражнение 3. Найдите в тексте слова cell, network, area, set и выберите правильное определение в данном контексте.

A cellular phone (cellphone) is a lightweight, portable radio transceiver, which can transmit and receive calls anywhere in cellular network area. It is a mobile telephone, which communicates through base stations situated in areas called cells. Cell is a subdivision of

communication area in a cellphone network. In the network, the same frequencies can be used for many different telephone calls at the same time. Each cell has its own small electronic base station and set of transmission frequencies. The sizes of the cell vary between 1 km to about 30 km across, depending on the output power of the cellphone transmitter.

a) a small room for one person
b) apparatus for producing electricity by chemical action
c) a compartment in a larger structure (e.g., in a honeycomb)

2. network

a) a system of lines that cross
b) a complex system if interconnected radio and TV devices
c) a connected system

3. area

a) a zone, region, district
b) surface measure
c) range of activity

4. set

a) a number of smth. of the same kind
b) radio, TV, phone apparatus
c) direction

Упражнение 4. Подберите к глаголам и словосочетаниям в колонке А глаголы с тем же значением из колонки В.

A

1. link up to
2. exchange news
3. send a signal, message, fax
4. show
5. take the place of
6. have, possess
7. make it illegible
8. have

B.

a. contain
b. connect
c. replace
d. make it difficult and impossible to read
e. own
f. communicate
g. transmit h. indicate

Упражнение 5. Замените выделенное слово или словосочетание другим словом с тем лее значением в данном контексте.
1. A Fax system can now send texts, graphics and documents to several places at the same time in less than a minute. The information may have photographic images as well as words. The latest Fax machines must be linked up to a special digital phone line. A few second's interference (помехи) on the phone line can make several lines of a document or text illegible.
2. Digital systems of information transmission have taken the place of analog systems in the last 25 years.
3. Most phones now have memories to store frequently used numbers. Some telephone manufacturers make phones with LCDs (liquid-crystal displays) which show the duration of calls.
4. Before World War II few people had television sets.
5. A lot of people have cellphones, answerphoncs and mobile phones now.
6. It is possible to exchange news with people in most parts of the world by telephone.

Упражнение 6. Заполните пропуски глаголами connect, transmit, communicate и производными словами.
1. A small radio receiver called a radiopagcr makes it possible for people to ... with each other wherever they are.
2. Data ... services, known as teletext ... text and graphics over a long distance as part of the television video signal.

3. In telecommunication the information can be directed between ... and receivers by cables of various kinds.
4. The lines which ... telephones within a building are the simplest type of ... line.
5. Mobile phone systems normally do not ... directly with other mobile phones. They send messages to the control base station.
6. How long will the ... of the new telephone take?
7. You can now ... your computer to computers all over the world by means of the Internet.

CONVERSATION

1. Critics usually say that the young people are too passive and too lazy because they watch TV so much now.
2. We don't need the telephone, telegraph and television

ТЕМА 3.9. УСИЛИТЕЛЬ

AMPLIFIERS

1. We are finally ready to apply the knowledge we gained in previous sections about electrons, vacuum tubes and transistors to some practical matters.[1] In the following sections we shall consider a variety of circuits employing electron tubes and transistors. Circuits are combinations of tubes or transistors with other components, such as resistors, capacitors and inductors, and form the basic building blocks of electronic systems: radio, automatic computer and so on. To understand the systems, you must be familiar with the circuits that make them up.
2. In this section we shall discuss amplifier circuits, or more specifically, audio amplifiers. An amplifier is an electron tube or transistor circuit, which builds up an ac signal applied to its input. It is called a voltage amplifier if the magnitude of the output voltage from the amplifier is considerably greater than that of the input voltage. As

a matter of fact the ratio of the output voltage to the input voltage is called the amplification or gain of the amplifier.
3. There are also so-called power amplifiers. These are similar to voltage amplifiers, except that their main purpose is to supply a considerable amount of power i. e. voltage times current to the output or load circuit, although the ac input signal may not draw any grid current and, hence, the input power may be zero.
4. When a number of amplifiers are hooked up in series so that the output of one serves as the input to the next amplifier stage, the function of the early stages is usually to build up the voltage to a high level, while the last stage builds up the power to a level sufficient to operate an output device. Audio amplifiers amplify electrical ac signals that have a frequency range corresponding to the range of human hearing, or from about 20 to 15,000 cycles per second.

Commentary

1. to some practical matters — на практике

EXERCISE

I. Review questions:
1. What do often electronic systems involve?
2. What is an amplifier?
3. What is a voltage amplifier?
4. What is the amplification or gain of the amplifier?
5. What is the main purpose of power amplifiers?
6. In what way are a number of amplifiers connected?
7. What do audio amplifiers amplify?

II. Make up an abstract of the text basing on the answers to the above questions.

III. Define to what patts of speech these words belong and translate them:

user, usage, misuse, useful, useless, usefulness, useless-ness, usefully, uselessly; various, variously, variable, variation, variety; converter, reconvert, conversion, conversely

IV. Translate these synonyms and memorize them:
1. magnitude (n), value, size, largeness, meaning
2. understand (v), realize
3. make up (v), constitute, form, build up
4. considerably (adv), very, greatly, substantially
5. calculate (v), compute
6. sufficient (adj), enough
7. purpose (n), goal, aim, objective
8. matter (n), affair, business
9. similar (adj), alike, the same as
10. as a matter of fact, in fact, in effect

V. Brush up these words and word combinations:
as a matter of fact, except that, finally, in turn, such as, and so on, a number of, while, considerably, similar

ТЕМА 3.10. ТЕХНИКА БЕЗОПАСНОСТИ

Выполнение упражнений по учебнику Луговой А.Л.

Промежуточная контрольная работа.

I. Прочитайте текст и переведите (письменно) второй абзац.

Elements of radio systems

1.Now that you have an overview of how radio waves propagate, let's take a look at how they are generated. The primary components in an HF radio system fall into three groups:

transmitters, receivers, and antennas. In many modern radio sets, the transmitter and receiver are contained in a single unit called a transceiver. In large, fixed systems, transmitting stations and receiving stations are customarily at separate locations, often controlled from a remote third site.

2.The transmitter may contain filters that are used to „ clean up" its output. A band pass filter removes noise, spurious signals, and harmonics generated in the exciter, or output frequency harmonics coming from the power amplifier. This process reduces interference with adjacent communications channels.

3.All modern HF receiving systems include an RF input filter/amplifier, a series of frequency converters and intermediate frequency (IF) amplifiers, a demodulator, and a local oscillator frequency synthesizer. To function, the receiver selects a desired signal, amplifies it to a suitable level, and recovers the information through the process of demodulation, in which the original modulating signal is recovered from a modulating carrier. With contemporary radio equipment, many of these functions are performed digitally.

II. Ответьте на вопросы к тексту:

1. Which primary components in HF radio system do you know?
2. What does a transmitter consist of?
3. A band pass filter removes noise, spurious signals, and harmonics generated in the exciter, doesn't it?
4. Do the modern HF receiving systems include an RF input filter/amplifier?

III. Дайте английские эквиваленты русских словосочетаний в скобках.

1. When (ток) to be measured are very small, one should use (гальванометр).
2. (Вольтметр) is a device to be used for (измерения разности потенциалов) in a circuit.
3. Insulators are materials having (низкое сопротивление).
4. (Ток большой величины) must be applied to (изоляторам) in order to make them conduct.
5. (Чем выше сопротивление изолятора) the greater the applied voltage must be.
6. Metals (увеличивают) their resistance when (температура возрастает).

IV. Сопоставьте русские и английские слова.

1. law	A. сопротивление
2. current	B. снабжать
3. voltage	C. прилагать, применять
4. to supply	D. уменьшать
5. resistance	E. переменный
6. to apply	F. закон
7. frequency	G. частота
8. to decrease	H. электрический ток
9. alternating	I. напряжение
10. flow	J. течение

V. Составьте предложения из следующих словосочетаний.

1. Nowadays electronic devices	1. airplanes, ships, trains and cars having built-in electronic circuits and instruments.
2. We are surrounded	2. is being used more widely at home and in office.
3. There are	3. without electronically, controlled machine-tools.
4. A personal computer	
5. People are carried by	

6. The modern production is unthinkable 7. It is impossible to imagine	4. with electronics everywhere in everyday life and at plants and factories. 5. scientific research without computers. 6. are in general usage. 7. electronic watches we wear, telephone, radio and TV sets we speak, listen to and watch.

Контрольные задания для текущего контроля.

КОНТРОЛЬНАЯ РАБОТА ПО ТЕМЕ 3.3.

Test 1

I. Find the correct answer out of the three given to each question:

1. Which of the following tubes consists of a cathode and a plate: a triode tube, a diode tube, a tetrode tube
2. Which of the following charges repel each other: like charges, unlike charges, positive and negative charges
3. Which of the following charges are emitted from the cathode of an electron tube: unlike charges, positive charges, negative charges
4. Which of the following charges in respect to the cathode must have an anode to transmit the direct current: positive charges, negative charges, neutral charges
5. Which of the following is established within the tube by applying a potential difference: an electric field, ionization, de-ionization

Test 2

I. Find an antonym (a), (b), (c) or (d) to the word in bold type:

1. To attract electrons — (a) produce; (b) conduct; (c) repel; (d) lose
2. To stop the plate current — (a) measure; (b) transfer; (c)

convert;
(d) start
3. Closed circuits — (a) open; (b) internal; (c) external; (d) different
4. A constant value — (a) high; (b) variable; (c) low; (d) abnormal
5. A simple structure — (a) heavy; (b) light; (c) complicated; (d) modern
6. To increase the stream of electrons — (a) obtain; (b) decrease; (c) change; (d) stop
7. The best method — (a) unknown; (b) main; (c) worst; (d) principal
8. The electrons are strongly repelled — (a) weakly; (b) never; (c) always; (d) quickly

II. Find an antonym (a), (b), (c) or (d) to the word in bold type:

3. To attract electrons — (a) produce; (b) conduct; (c) repel; (d) lose
4. To stop the plate current — (a) measure; (b) transfer; (c) convert; (d) start
3. Closed circuits — (a) open; (b) internal; (c) external; (d) different
9. A constant value — (a) high; (b) variable; (c) low; (d) abnormal
10. A simple structure — (a) heavy; (b) light; (c) complicated; (d) modern
11. To increase the stream of electrons — (a) obtain; (b) decrease; (c) change; (d) stop
12. The best method — (a) unknown; (b) main; (c) worst; (d) principal
13. The electrons are strongly repelled — (a) weakly; (b) never; (c) always; (d) quickly
9. To be connected externally—(a) indirectly; (b) directly; (c) strongly; (d) internally
6. Electrons emitted from the cathode of an electron tube are...

(a) positive electric charges; (b) positively charged particles; (c) negative electric charges.
7. An electric field is established by applying to the electrodes...
(a) heating energy; (b) a potential difference; (c) light energy.
8. Electron current flows in the diode only when...
(a) the plate is made negative; (b) the plate is made positive; (c) the plate has no charges.
9. Electron current flows in the diode only when...
(a) the cathode is made positive; (b) the cathode has no charges; (c) the cathode is made negative.
10. At a given operating temperature the total number of electrons emitted by the cathode of a diode is always...
(a) different; (b) the same; (c) increasing.
11. The cloud of electrons formed in the space between the cathode and the plate is called...
(a) a space charge; (b) an interelectrode space; (c) a positive external charge.

КОНТРОЛЬНАЯ РАБОТА ПО ТЕМЕ 3.4.

Test 1

Find the correct answer out of the three given to each question:
1. Which of the following tubes converts an electrical signal into a visual one:
a) a diode tube b) a triode tube c) a cathode-ray tube
2. In which of the following devices a cathode-ray tube is used:
a)a radio-receiver b)an ac amplifier c)an oscillograph
3. Which of the following particles are to be removed from the cathode-ray tube when it is operating: a)electrons b) neutrons c)gas molecules
4. By means of which of the following fields the electron deflection is produced in the above mentioned tube:

a) a magnetic field b)an electrostatic field c)the combination of magnetic and electrostatic fields
5. Which of the following parts of the cathode-ray tube is used for producing a narrow beam of electrons:
a)an electron gun b) plates of the deflecting system c)a fluorescent screen
6. Which of the following parts of the cathode-ray tube the investigated signal enters:
a)the electron gun b)the vertical deflecting plates c)horizontal deflecting plates

Test 2

I. *Find Russian equivalents for the English verbs:*

1. mount	(a) желать
2. combine	(b) считать, рассматривать
3. deflect	(c) случаться, появляться
4. consider	(d) помещать
5. adjust	(e) производить
6. place	(f) объединять(ся)
7. desire	(g) сокращать
8. abbreviate	(h) отклонять(ся)
9. produce	(i) монтировать
10. occur	(j) регулировать

II. *Find Russian equivalents for the English words and word combinations :*

1. readily	(a) иначе
2. otherwise	(b) посредством
3. let us	(c) среди
4. in effect	(d) легко
5. among	(e) после; после того как
6. such as	(f) давайте
7. by means of	(g) такой как; как например

8. after (h) как ... так и
9. both ... and (i) иногда, случайно
10. occasionally (j) в действительности

III. *Find Russian equivalents for the English words and word combinations:*

1. besides (a) тот же самый
2. in order to (b) при условии, если
3. the same (c) такой
4. provided (d) кроме того, помимо
5. such (e) любой
6. how (f) относительно
7. relatively (g) вдоль, по
8. any (h) посредством этого
9. along (i) как
10. thereby (j) для того, чтобы

IV. *Match these synonyms .*

1. give off (a) in effect
2. means *(n)* (b) emit
3. hence (c) stable
4. speed (d) precise
5. steady (e) highly
6. period (f) velocity
7. accurate (g) rapidly
8. in fact (h) therefore
9. quickly (i) cycle
10. very (j) way

Test 3

Find a synonym (a), (b), (c) or (d) to the word or word combination in bold type:

1. The process takes *place* — (a) shows; (b) indicates; (c) means; (d) occurs
2. *To* accelerate *electrons* — (a) conduct; (b) focus; (c) emit; (d) speed up
3. *To* regulate a *device* — (a) produce; (b) fix; (c) adjust; (d) construct
4. *To* choose a *conductor* — (a) apply; (b) use; (c) connect; (d) select
5. A *broad* beam — (a) long; (b) wide; (c) light; (d) short
6. An electron *beam* — (a) flow; (b) ray; (c) gun; (d) device
7. To *indicate* the polarity — (a) represent; (b) show;(c) use; (d) provide
8. To *guide* electrons — (a) liberate; (b) conduct; (c) give off; (d) accelerate
9. A difficult *job* — (a) task; (b) work; (c) situation;(d) position
10. The applied *technique*— (a) machine; (b) instrument; (c) method; (d) device
11. To *consist* of elementary particles — (a) knock out;(b) depend on; (c) find; (d) be made up of
12. To *investigate* the voltage—(a) research; (b) determine; (c) know; (d) measure
13. A *highly* sensitive device — (a) good; (b) new;(c) very; (d) modern
14. *Several* devices — (a) a lot of; (b) the same; (c) five;(d) a few
15. The battery *supplies* energy — (a) uses; (b) changes; (c) furnishes; (d) adjusts
16. To move *rapidly* — (a) in the same way; (b) quickly; (c) slowly; (d) quietly
17. *Accurately* obtained trace—(a) usually; (b) earlier; (c) exactly; (d) previously
18. The *image* of the input signal — (a) form; (b) speed; (c) period; (d) representation
19. The *essential* part of — (a) main; (b) other; (c) second; (d) last
20. The same kind of *matter* — (a) work; (b) substance; (c) energy; (d) voltage

Test 4

Finish each sentence choosing one of the three variants (a), (b) or (c) based on the texts from Section V:

1. Cathode-ray tubes provide... (a) the generating of the sound waves; (b) amplification of low electrical signal; (c) a visual representation of voltage and current waveforms.
2. Cathode-ray tubes consist of...
(a) one basic component; (b) two basic components; (c) three basic components.
3. One of the essential parts of a cathode-ray tube is...
(a) an electron gun; (b) a source of positive voltage; (c) a transistor amplifier.
4. A narrow beam produced by an electron gun accelerates focuses and consists of...
(a) positive ions; (b) electrons; (c) protons,
5. A deflection system...
(a) produces electrons; (b) deflects the electron beam;(c) is the source of electrons.
6. A fluorescent screen produces...
(a) an electron beam; (b) an alternating current; (c) a spot of visible light.
7. The fluorescent screen is covered with...
(a) fluorescent materials; (b) conducting coating of carbon particles; (c) a thin copper coating.
8. The essential parts of a cathode-ray tube are housed in...
(a) a hollow cylinder; (b) a glass envelope; (c) a metal box.
9. The method used for removing the electrons from the screen and returning them to the cathode is...
(a) to place the Aquadag coating; (b) to remove the cathode; (c) to place an anode battery.
10. The essential part of all oscillograph and TV receivers is...

(a) a transistor oscillator; (b) a cathode-ray tube;(c) a generator of the alternating current.

ЗАДАНИЯ ДЛЯ САМОСТОЯТЕЛЬНОЙ РАБОТЫ

TEXT 1

Read the text « What is Energy? » and try, to understand its basic contents.

What is Energy?

"Energy" can best be described as a source of power which is used to do work. There are various forms of energy: energy of movement, energy in materials such as coal or wood and energy in nature. Natural energy is in the power of the wind, the power of water and in the heat of the sun. All forms of energy are important, whether man-made like electricity, or natural like wind-power. Perhaps the energy that comes directly from the sun is the most important for without it all life on the earth would soon die. The sun gives out energy in the form of light and heat to plants or animals or people and helps them to grow. As the plants receive energy from the sun, they give out oxygen, which is necessary for human and animal life. The oxygen is taken into the blood supply, which feeds the body. Human beings also take in energy from the sun this alone is not enough for a person to live. People also need other forms of energy which they get by eating plants and the neat of animals.

People have always worked. A long time ago, all the work was for survival. As the amount of work grew, the amount of power needed to do this work also grew.

Finding the power of fire was an important step in the changing and growing use of energy. It was probably discovered by accident when the sun made something burns - perhaps a dry tree in a hot

summer. Soon it was controlled and fire could be used as a source of energy. There were many things in the world which would burn and they could be found easily. There were plenty of bushes and trees and there were also pieces of black rock which would also burn; this black rock was coal. There were also pools of oil which burned.

All these things which burn in the air are called fuels and they are all natural materials.

Comprehension check

1. What is energy?
2. What are the various forms of energy?
3. What are the man-made forms of energy?
4. What are the natural energy sources?
5. Why is the energy of the sun so important?
6. Is it enough for a person to live?
7. In what way was the power of fire discovered?
8. What is a fuel? Give three examples of fuels which are used at the moment.

Language Study

1. Explain what these words mean:
Oxygen; fuels; accident; by accident; solar energy, amount, power.
2. Find a word which means the same as these words:

a. force	e. the supply of something
b. Part of the air	f. a lot of
c. provide	g. significant
d. quantity	h. water or another liquid gathered in one place, usually outside

3. Find the nouns from these verbs: For example, to receive - reception a. discover
e. use b. move f. grow c. survive , g. insulate d. describe h. die
4. Write sentences to show the difference in meaning between the

following pairs of words.

a. Whether weather	d. pull pool	g. food feed
b. meet meat	e. sun solar	h. wind n. wind v.
c. piece peace	f. blood bleed	i. disused misused unused abused

5. Open the brackets putting the verbs in the Simple Past.

A lot of coal (be found) on the earth many years ago but most of the coal (can) only be found under the ground. The reason for this is that coal (be made) by trees which (die) millions of years ago. The trees (sink) into mud which was carried along by rivers; and the wood slowly (change) into coal. The coal (be buried) deep in the ground by the movement of rooks, earth and plants which (press down) on it and (form) different layers above it. When people first (look) for coal under the ground, there (be) many accidents and coal-mining (be) a very dangerous job.

Oil (be) made from very small sea animals. When they (die), they (sink) to the bottom of the sea. The weight of heavy rocks (push) all the dead bodies together and after many millions of years, they (change) to oil. When oil (be discovered) under the ground, the gas was not considered useful. It (be seen) only as one more problem in the search for oil and (be burned) off so that the oil (can be) reached more quickly. But after many years of burning off the gas, it (be realised) that the gas (be) also a useful fuel.

Activities

1. Both water and wind power are cheap forms of energy. They are easily available but one can find certain problems while these forms of energy are produced. What are they?

2. Energy has become a source of political power and a source of problems because the industrial nations of the earth depend very much on their energy supplies. Discuss the problem.

Use the introductory phrases.

1. Let us start with (look at, turn to, proceed to) ...
2. I think (believe, suppose) ...
3. In my opinion, as far as I know, as far as I can judge, for all I know ...
4. It has been (will be) shown (pointed out, considered) that...
5. It is evident (obvious, unlikely, doubtful) that ...

TEXT 2

Read the text « the Discovery of Radioactivity » and try, to understand its basic contents.

The Discovery of Radioactivity

The discovery of radioactivity was due more or leas to pure accident. Once during the year 1896 Henry Becquerel, professor of physics at the Sorbonne obtained a preparation of uranium bisulphate for the purpose of studying the phosphorescence of this substance. But his interests were drawn in some other direction, and he threw the material into one of the drawers of his work-table.

Now it happened that in this drawer was a box containing some unexposed photographic plates, and the ampoule of uranium bisulphate fell right on top of that box, remaining there undisturbed for several weeks. Intending to take some photographs, Becquerel finally opened the drawer, pushed aside the ampoule with the forgotten preparation, and took out the box with the plates. But when he developed his photographs he found that the plates were badly spoiled as if they had been previously exposed to light. This was very strange, since the plates had been carefully wrapped in thick black paper and never yet opened. The only object in the drawer that might have been responsible for the damage was the preparation of uranium bisulphate, which had for so long rested so close to the plates. He repeated the experiment with some new plates. But this time he

deliberately placed an iron key from one of the drawers between the photographic plate and the hypothetical source of the mysterious radiation.

A few days later a diffuse silhouette of the key began to appear slowly against the darkening back ground of the negative. Yes, it definitely was a new kind of radiation coming from the atoms of uranium, a radiation that easily penetrated materials nontransparent to ordinary light but was still unable to pass through the thickness of an iron key.

Subsequent investigations have shown that the only other element known at that time capable of the same type of spontaneous radiation was .thorium, the heaviest element after uranium; but the laborious search undertaken by a scientific French Couple, the Curies, soon led to the discovery of entirely new radioactive elements, one of them was called radium and the other polonium, in honors of Madame Curie's native country.

Comprehension check

1. Who discovered radioactivity?
2. Did it happen quite by chance?
3. How did Becquerel find a new kind of radiation coming from the atoms of uranium?
4. What other elements were capable of the same radiation?
5. Who discovered radium and polonium?

Language focus

1. Find a word which means the same as these words a. a small, sealed, glass capsure;
b. intentionally, on purpose; c. to force a way into the inside of d. obscure, secret, incomprehensible; e. opaque, not transparent; f. following or coming after; g. ground at the back, the space behind the principal figures of a picture; h. clean, mere; i. an aim, end, target

j. matter; k. a box.
2. What are the nouns connected with the following verbs?
1. discover 4. appear 7. diffuse
2. expose 5. conclude 8. penetrate
3. invent 6. analyse 9. experiment
3. Translate into Russian paying attention to different meanings of the word "time".
a. The only other element known at that time capable of the same type of radiation was thorium.
b. This time he deliberately placed an iron Key between the photographic plate and uranium.
c. We shall study the XIX century ideas of the atom and at the same time we shall have to consider statistical mechanics.
d. Five times six is thirty. e. It is time to clear up the mystery.
f. I am sorry to interrupt you, but your time is up. g. The activity of radium is several million times that of uranium.
h. The plan was fulfilled in time.
i. When was this book published for the first time?
4. Make up sentences beginning them with the introductory phrases: We should remember that ... Further study proves that ... Careful research demonstrates that ... Thorough study confirms that ... Extensive investigations make it clear that ... Numerous experiments suggest that ... Detailed analysis shows that ...

5. Answer the questions making use of the introductory phrases of the previous exercise.
Example: Is there any agreement between the theory and the data obtained? Yes, there is. Careful research has shown that this is the case.
a. Are there any data in favour of this theory?
b. Is there any evidence against the hypothesis proposed?
c. What made you employ a new method?
d. Which of the two approaches should be accepted? -

e. What can the lack of vitamin D be compensated by? (the use of ultraviolet radiation).
f. Was Democritus Right to suppose that all matter was made up of tiny particles?
g. Can everything be accounted for by means of the Theory of Relativity?
h. What is the most reliable method to determine the age of earth based upon? (rates of radioactive decay of radium and uranium).

TEXT 3

Read the article about one of the American physicists and translate it. Think of the way his parents encouraged him when he was a young child. Suggest the further development of his career as a scientist.

The Man who Moves Atoms

Around 400 B.C. the Greek philosopher Democritus postulated the existence of an ultimate "uncuttable" particle of matter he named the atom. It has taken 24 centuries for humans to actually seize one and move it. Physicist Eigler did at California Research Centre. Not only has he succeeded at moving individual atoms but he has also begun to assemble them in primitive structures, auch as the row shown.

Eigler used a Nobel Prize-winning IBM invention the scanning tunneling electron microscope. That remarkable instrument made atoms on surfaces clearly visible for the first time. It works by positioning a fine metal probe next to the material under observation. A weak voltage applied between the tip2 and the material causes electrons to flow between the two; tunneling refers to the quantum mechanical process by which the electrons cross the gap. As the tip is moved along the surface, it reveals the contours of the atoms below.

Scientists suspected that the microscope could be used to rearrange atoms. They reported having moved a germanium atom inadvertently3 picked up by the microscope tip. But they were unable

to control the phenomenon, in part because atoms at room temperature are too energetic - they literally jump away.

Eigler, meanwhile, modified a microscope to operate in a vacuum at temperatures near absolute zero, conditions under which atoms are tamer. The project took five years; he says his Knack for building things derives from childhood training by his father, an aerospace engineer.

Notes: 1. seize - to take possession of;
2. tip - the small point or top of anything;
3. inadvertently - unintentionally;
4. tame - having lost native wildness;
5. the faculty of doing a particular thing skillfully.

Activities

1. Give a short account of how Henry Becquerel discovered radio activity.
2. Speak of some discovery in science you know of.
3. The most outstanding discovery of the XIX century.
4. The most outstanding discovery of the XX century.
5. Speak of some unsolved problems in your field of research.

TEXT 4

Read the text and select one of the variants given below as its title: " Interrelation between different scientific disciplines; Brownian Motion; Prom the Histojfy of modern physics.

Because a phenomenological theory is advanced to picture phenomena which are observed in substances, the concepts introduced inevitably reflect the characteristics of the means of observation. Thermodynamic concepts are apt when the phenomena are almost static. On the other hand, if the phenomena are dynamic with higher frequencies, we must resort to other concepts unfamiliar in thermodynamics, such as those used in the theory of electric circuits. We should note that in discussing high-frequency phenomena we have

to alter the precision of our description, shifting it to a more microscopic level.

Brownian Motion

In 1827 the botanist Brown discovered under his microscope vigorous irregular motion of small particles originating from pollen floating on water. He also observed that very fine particles of minerals undergo similar motion as if they were living objects. This discovery must have been a great wonder at that time. The idea of combining such a motion - Brownian motion -with molecular motion became fairly widespread in the latter half of the nineteenth century when atomism had not yet been fully recognized as reality. It was, however, the celebrated work of Einstein, which appeared in 1905, that gave the first clear theoretical explanation of such a phenomenon which could be directly verified quantitatively by experiments and thus established the very basic foundation of the atomic theory of matter. Einstein did not know that Brownian motion had actually been observed many years before when he first came upon this idea to verify the reality of the atomic concept. At any rate, Einstein's theory had a great impact at that time, finally convincing people of the theory of heat as molecular motion, and so paved the way to modern physics of the twentieth century. It also greatly influenced pure mathematics, that is, the theory of stochastic processes.

The theory of stochastic processes, called the Wiener process, was initiated by I. Wiener as a mathematical model of Brownian motion. Some years later this was combined with Feynman’s path integral formulation of quantum mechanics. R.P.Feynman did not know of Wiener's work when he devised this method independently. It is very instructive that such unconscious coincidences often arise at very decisive moments in the progress of science in seemingly far separated disciplines.

The theory of Browniaa motion was further developed by P.langevin, M.Smoluchowaki, S.E.Uhlenbeek, L.S.Ornstein, and many

others.

Notess 1. apt - suitable;
2. vigorous - strong, energetic;
3. pollen - powder formed in flowers.

Comprehension check
1. What is the term for static phenomena?
2. What concepts are used to describe dynamic phenomena?
3. In what way did Brown make his discovery?
4. What other discoveries paved the way to modern physics of the twentieth century?

Language focus
1. Explain what these words means
atomism; concept; verify; stochastic; quantum; coincidence; float; integral; thermodynamic; circuit.
2. Find a word which means the same as these words:
a. excellent, beautiful, delicate, subtle, of high quality;
b. the same, identical;
c. to acknowledge;
d. in any case, anyhow;
e. influence;
f. to persuade;
g. contemporary,
h. to invent, contrive, to scheme;
i. the occurrence of one event at the same time as ...
3. Give the opposites to the following words:
a. familiar b. regular c. dependent d. conscious
e. common
f. dynamic
g. appropriate
h. similar

4. Write sentences to show the difference in meaning between the following pairs of words:
a. mean v. means n.
b. further farther ;
c. latter later
d, alter n. alter v.
e. accept except
f. concept conception
g. science since
5. Translate the following sentences paying attention to different ways of expressing the idea of likeness.
a. This term is similar to that concept.
b. Each molecule in a compound' is the same as all the other molecules in the same compound, c. Venus is much like the earth in size, mass, and distance from the sun. d. The law discovered in a small laboratory was identical with that of nature.
e. These expressions resemble each other in form. f. Electric currents are analogous in many ways to stream of water, g. There is no difference between the data presented.
6. Translate the following sentences paying attention to modal verbs.
a. This discovery must have been a great wonder at that time, b. $0 scientist can be depressed at the prospect of endless
discovery. c. Fuels which are used to produce energy at the moment are bound to run out.
d. Only a small part of the water energy which could be used is indeed used.
e. It seems certain that people will have to depend on nuclear power as the future source of energy.
f. Many suggestions have been made some of them are not very practical but others could be used successfully, g. Hydro-electricity is likely to develop only in certain countries.
h. Electricity can be produced by using the forces of the tides to turn the blades of a turbine.

i. The sea can provide energy in other ways.
j. You can see the energy of the waves.
k. Another way we may get energy from the sea is to use the power from under the oceans.
l. A cheaper source such as nuclear energy might be used in future. m. It may seem strange to think of wood as an alternative energy source.
n. What can physics predict about Brownian motion?

TEXT 5

Read the text « Solar Energy » and try, to understand its basic contents.

Solar Energy

The sun gives plants and trees energy to help them grow. It is the energy from the sun caught and held by trees millions of years ago which makes fuels such as coal and oil good producers of energy now. The sun is the most powerful source of energy known on earth. More energy is produced by the sun than the world could ever use. If the energy from the sun could be caught and used to make electricity, then the energy crisis would disappear and there would be a cheap, never-ending source of power without any danger to human life.

Unfortunately the collection and storage of the solar energy can be both difficult and expensive. Some form of storage is necessary because the sun's rays do not reach us on cloudy days or at night. None the less, solar energy is now an economic and practicable solution and is widely used in many countries.

It is possible to convert solar energy directly to electricity by the use of photoelectric cells but for moat practicable purposes this is too expensive a way to produce electricity. Today's solar energy systems are of two main types, based on the flat plate collector and the focusing collector.

The flat plate collector is simpler and cheaper. In its simplest

form, the sun's rays fall onto a panel. Pipes earring water are embedded in the panel. The sun heats the water, which is then available for use. Modern flat plate collectors are carefully designed to absorb the maximum possible amount of energy and to prevent heat loss to the surroundings. They are mainly used for the provision of domestic hot water. They are commercially available and are in use in many countries. Focusing systems enable a much higher proportion of the sun's energy to be trapped and also produce much higher temperatures. The principle has been known for a long time. Archimedes used it in 212 B.C. when he used focusing mirrors to set fire to the Roman fleet.

A major focusing collector system has been built on the outskirts of Minneapolis in the USd. The solar energy plant is designed to power a 200 ton air-conditioning plant, which Keeps a building with a floor area of 100,000 square feet cool in summer. This is an ideal arrangement as the peak supply of solar energy is available at the hottest time of day when the air conditioning is most needed. Solar energy also heats the building's hot water and makes a contribution towards heating the building in the winter.

However solar systems which depend upon concentrating the sun's rays need clear sunlight. Focusing reflector systems will not work with diffuse sunlight.

Sweden is looking to solar energy for a major contribution to her power needs. A recent report suggested that by the year 2015 Sweden could be using 37/6 more energy than in 1975 and all of it could be supplied from domestic and renewable energy sources. Substantial amounts of this would be solar-generated electricity as well as direct solar heating. The Swedish government has backed large scale practical research into both solar energy production and energy conservation.

Comprehension check

1. What is the most powerful source of energy?

2. Is it easy to collect and store solar energy?
3. Is it possible to convert solar energy directly to electricity?
4. What are the two main types of today's solar energy systems?
5. What do solar systems depend upon?
6. What are the countries that have backed large scale practical research into both solar energy production and energy conservation?

Language Study

1. Explain what these words mean:

plate; pipe; panel; diffuse; trap; reflector; ray; electricity; absorb.

Use the language of science where it is necessary. For example:

In the language of science the words "force", "work", "energy" and "power" have definite meanings differing a little from the meanings that are often given to them in everyday life. Force is a "push" or a "pull", it tends to produce, change or cheek motion. Work is done when a force is acting over a distance. The amount of performed work is equal to the product of the force by the distance. Power is defined as the rate of doing work. We de

fine energy as capacity to perform work.

2. Find a word which means the same as these words: a. accessible d. saving g. search v. b. mirror e. A great problem h. aim c. main f. in the home i. nevertheless

1. limited to the present or recent time

j. a narrow beam k. monotonous, uniform.

3. Find the adjectives from these nouns; For example, danger - dangerous, a. fortune d. focus g. system b. cloud e. difficulty h. substance c. care f. energy i. practice

TEXT 6

Read the text « Nuclear Energy» and try, to understand its basic contents.

Nuclear Energy

Long ago it was thought that the atom was the smallest piece of matter that there was. He word "atom" comes from the Greek word "atomos", which means "cannot be cut". About 70 years ago, however scientists found that atoms could be broken, or split, into smaller pieces and if they were split, a great deal of energy would be given off. This splitting of the atom, or fission, as it is called, was first pat into practice in 1939, when scientists found that atoms of uranium, which is a sort of fuel like coal, could be split if they were hit by large numbers of neutrons. A neutron is even smaller than an atom and can normally be found inside the centre of the atom. So it became possible to split the atom and so make a lot of heat energy. After a lot of work on the subject, scientists found that they could produce an even greater amount of heat by splitting a number of atoms one after the other, in what is called a chain reaction. Sadly, this nuclear power was first used in the form of a bomb which caused much damage and killed a lot of people on the is land of Hiroshima at the end of the Second World War in 1945. After the War nuclear power stations were developed to produce electricity.

There was a risk of an accident, because so much energy is produced by splitting the atom, that the energy production can hardly be controlled. Public anxiety has grown particularly after the Chernobyl disaster. The damaging effect resulted in a dramatic increase of cancer and birth defects.

Another problem with nuclear power stations is the question of what to do with the nuclear waste. The waste also gives off radiation and remains highly dangerous for thousands of years.

The supply of uranium will, like the other fuels such as coal and oil, come to an end. But a new development could make uranium unimportant in the production of nuclear power. There are certain types of atoms which when they hit each other at great speed, do not break apart but join together. This is called fusion and it also produces

energy. It is believed that the sun's energy is produced in this way. The material which is needed to make atoms join together can be found in sea-water and because more than three quaters of the earth is covered by sea water, this source of energy will not run out. At the moment, work on the fusion of atoms is not complete and there is still much to be done. But it could be that nuclear energy produced in this way will be the solution to the energy crisis.

Comprehension check

1. What does the word "atom" come from?
2. When was fission first put into practice?
3. What is a chain reaction?
4. When were the first power stations built?
5. What are the problems with nuclear power stations?
6. What is "fusion"?

Language focus

1. Find a word which means the same as these words: a. to break into two pieces; b. natural material;
c. when two atoms break apart; d. a natural material, a fuel for nuclear energy; e. a part of an atom;
f. to change something in a bad way, to hurt it; g. the sending out of energy; h. what is left when the nuclear fuel has been burnt up and cannot be used anymore; i. when two atoms are joined together; j. a malignant growth.
2. Read the following sentences and try to work\out the meaning of phrasal verbs. Some you will know, others are more difficult.
a. Our supplies are running out.
b. In the meeting one of the, committe-members brought up the problem of clean manufacturing and development of solar power. c. Can't you talk about something else?
You always go on how unlucky you are. d. Nobody is going to give us any more money; we'll just have to get by on what we've got.

e. Scientists will have to come up with new methods of increasing the world's food supply, f. I think that's all. Have I left anything out? g. There is no need to bring up his past when we are considering him for employment.

4. Put the verbs into the correct form.

Example: If there were no theories there would be ... (be) no science.

a. If we knew the limits to a law we ... (know) in what situations it ... (give) a satisfactory answer, b. If they had developed the idea it ... (make) the hydrogen bomb seem a mere candle, c. If they ... (have) a purpose and a belief they would be almost invincible, d. If he did what would be so easy-arranged to be interviewed on television, or wrote a series of newspaper articles on the subject - he ... (may) be listened to, but I think it more probable that people would simply dismiss him. e. If they had done it they ... (become) international celebrities, f. But for the power of self-renewal he ... (experience) a sort of a "mind cancer", g. If they ... (be) all routine test papers he would get his secretary to pack them straight off to the University.

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