



**МИНИСТЕРСТВО ОБРАЗОВАНИЯ
РЕСПУБЛИКИ БЕЛАРУСЬ**

**Белорусский национальный
технический университет**

РЕСПУБЛИКАНСКИЙ ИНСТИТУТ ИННОВАЦИОННЫХ ТЕХНОЛОГИЙ

Кафедра «Технологии инженерного образования»

**АНГЛИЙСКИЙ ЯЗЫК
В СФЕРЕ ТЕХНИКИ И ТЕХНОЛОГИЙ**

Курс практических занятий

**Минск
БНТУ
2015**

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Курс практических занятий
для слушателей курсов повышения квалификации

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С о с т а в и т е л ь

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Курс практических занятий состоит из шести разделов, каждый из которых включает технические тексты на английском языке, теоретический материал по наиболее сложным темам английской грамматики и лексико-грамматические упражнения, предназначенные как для аудиторной, так и для самостоятельной работы слушателей курсов повышения квалификации.

Курс может быть использован в работе с аспирантами и студентами технических специальностей вузов.

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ВВЕДЕНИЕ

Курс практических занятий предназначен для слушателей курсов повышения квалификации по направлениям «Английский язык в сфере техники и технологий» и «Профессиональная коммуникация специалиста» и ориентирован на развитие языковых и коммуникативных навыков в сфере профессионально ориентированного общения. Может быть использован как на занятиях под руководством преподавателя, так и для самостоятельной работы слушателей.

Курс состоит из шести разделов (Units), каждый из которых включает несколько специализированных (профессионально-ориентированных) текстов на английском языке, заданий, предназначенных для формирования языковых и лексико-грамматических навыков и развития соответствующих умений устной речи в ситуациях профессионального общения, а также для обучения просмотровому, изучающему и ознакомительному чтению, устному переводу и письменной речи.

Текстовый материал заимствован из зарубежных источников, его тематика определена программой курса. Комплекс заданий основан на функционально-коммуникативном подходе, предполагает взаимосвязанное обучение всем видам речевой деятельности. Определенные коммуникативные задачи реализуются в приведенных ситуациях профессионально ориентированного общения и направлены на формирование коммуникативно-компетентной личности преподавателя технических дисциплин.

Цели курса:

- готовить слушателей к естественной коммуникации в устной форме и использованию языка в профессиональной деятельности;
- развивать познавательные способности слушателей с использованием современных источников информации;
- совершенствовать навыки перевода с английского языка на русский;
- изучать особенности лексических и грамматических вопросов перевода;

– развивать умения грамматического анализа специальных технических текстов.

Задачи:

– развивать и совершенствовать навыки самостоятельной работы над языком;

– активизировать все виды речевой деятельности: устная речь, чтение, письмо, восприятие речи на слух, перевод;

– расширять кругозор слушателей в контексте иноязычной культуры.

UNIT 1

Текст: ENERGY AND ELECTRONS.

- Перевод субъектного инфинитивного оборота.
- Перевод инфинитивного оборота с предлогом *for*.

Перевод субъектного инфинитивного оборота

Инфинитивный оборот *Complex Subject* состоит из двух частей. Первая — существительное в «общем» падеже или местоимение в именительном падеже; вторая — инфинитив, выражающий действие, которое выполняет лицо или предмет существительное или местоимение).

Особенностью этого инфинитивного оборота является то, что первая и вторая части разделены сказуемым, которое выражено личной формой глагола в страдательном залоге или глаголами типа *to seem, to appear* и др.

Complex Subject употребляется для упрощения предложений. Такое упрощение происходит следующим образом: подлежащее придаточного предложения становится подлежащим простого распространённого предложения, сказуемое главного предложения заменяется и согласуется с новым подлежащим, а затем следует сказуемое придаточного предложения в форме инфинитива, который обозначает действие подлежащего. Инфинитив употребляется с частицей *to* после всех глаголов.

It is known that sunlight activated various chemical reactions.

Sunlight is known to activate various chemical reactions.

Известно, что **солнечный луч активизирует** различные химические реакции.

Сочетание *is known* указывает лишь на определенное отношение к содержанию предложения. Местоимение *it* и союз *that* опускаются.

Перевод инфинитивного оборота с предлогом *for* **Случай употребления оборота *Complex Subject***

В английском предложении очень часто инфинитив стоит за существительным или местоимением с предлогом *for*, образуя с ним

Как было отмечено, инфинитивный оборот (*Complex Subject*) состоит из двух частей. При переводе на русский язык необходимо учитывать, что сказуемое может иметь любое время.

These forms of radiant energy have been found to travel through space with a big speed.

Такие формы излучения энергии, **как было установлено**, распространяются в пространстве с большой скоростью.

При переводе сказуемого необходимо обратить внимание на форму инфинитива. Инфинитив типа *to be* передается с помощью глаголов настоящего или будущего времени.

Atoms were assumed to be indivisible particles of the elementary substance.

Допускали, что атомы (**есть**) неделимые частицы вещества.

В научно-технической литературе часто встречаются глагол-связка *to be + likely* или *to be + unlikely*. После этих конструкций *In-definite Infinitive* переводится на русский язык личной формой глагола в будущем времени.

Under these conditions the output is likely to increase.

При этих условиях выпуск продукции **вероятно возрастет**.

Перфектная форма инфинитива (*to have been*) переводится на русский язык глаголом прошедшего времени.

This scientist is supposed to have developed a new method.

Предполагают, что этот ученый **разработал** новый метод.

Если глагол сложного сказуемого стоит в отрицательной форме действительного залога, то при переводе на русский язык отрицание относится к инфинитиву.

This method does not seem to offer any advantages.

Кажется, что этот метод **не дает** никаких преимуществ.

Если же глагол сложного сказуемого стоит в отрицательной форме страдательного залога, то отрицание относится к этому глаголу.

Such reaction was not observed to happen.

Не **видели**, чтобы происходила такая реакция.

Инфинитивный оборот с предлогом *for* в предложении употребляется:

<p>1. При сказуемом в страдательном залоге, выраженном глаголами: <i>to say, to state, to believe, to consider</i> и др.</p>	<p><i>He is said to live in Canada.</i></p>	<p>Говорят, что он живет в Канаде.</p>
<p>2. При сказуемом в страдательном залоге, выраженном глаголами: <i>to hear, to feel, to watch, to notice</i> и др.</p>	<p><i>We were seen to enter the theatre.</i></p>	<p>Видели, как мы зашли в театр.</p>
<p>3. При сказуемом в страдательном залоге, выражением глаголами: <i>to order, to ask, to request</i> и др.</p>	<p><i>The secretary was ordered to bring all documents.</i></p>	<p>Приказали, чтобы секретарь принес все документы.</p>
<p>4. При сказуемом действительного залога, выраженном глаголами: <i>to seem, to appear, to happen, to prove</i> и др.</p>	<p><i>She seemed not to listen to him.</i></p>	<p>Казалось, что она не слушала его.</p>
<p>5. При именном составном сказуемом типа: <i>be likely, be unlikely, be certain</i> и др.</p>	<p><i>They are likely to come soon.</i></p>	<p>Они, наверно, скоро придут.</p>

Read the text.

ENERGY AND ELECTRONS

The structure of the atom is similar to planetary system, electrons orbiting around a central nucleus. Electrons also rotate about their own axes. We know the rate of electron rotation and the orbital path determine the amount of energy possessed by the atom.

The total energy contained in any atom is known to be the sum of the energies of the individual electrons. Electrons of a given atom can be changed from their position by different energies. Radioactive materials, for example, are constantly undergoing a change. Radioactive energy emitted from the material changes it from one form to another. It is also possible to change the atom structure by means of controlled nuclear reaction. The atomic bomb and the hydrogen bomb are known to be example of great amount of energy contained in an atomic structure. There are much simpler methods of changing the amount of energy in a given atomic structure. A photoelectric cell, for example, has a large area, photocathode, made from chemically active materials. These materials are known to be alkaline metals.

They are electrically active to the degree that they emit electrons when struck by light.

Light falling on the cathode will cause electrons to be emitted; the anode being supplied with a positive potential, electrons will be attracted toward it, producing a photoelectric current. This is well-known photoemissive cell; it has many uses in modern industry. Basic laws governing the photoelectric effect were studied by Stoletov. They are also true for the laser operation. There are two basic laws of photoelectricity.

The first law is known to state that the number of electrons released per unit of time from photoelectric surface is directly proportional to the intensity of the incident light. Thus, the more intense light, the greater is the number of electrons to be released. This law states that the greater the light intensity, the greater is the current flow in the photoelectric cell.

The second law is known to state that the maximum energy of electrons coming from photoelectric surface is independent of the intensity of the incident light and is directly proportional to the frequency of the light. It can be shown experimentally that the maximum energy of electrons depends only on the frequency of the light falling of the cathode surface. The higher the frequency of incident of radiation, the higher is the energy of photoelectrons.

The photoelectrons the light energy which falls on the photocathode excites the outers of the atoms. Thus, the light energy causes photoemission.

Vocabulary notes

nucleus (pl. nuclei) — ядро (ядра)

to undergo - испытывать, подвергаться

hydrogen bomb - водородная бомба

photoelectric cell - фотоэлемент

photocathode - фотокатод

alkaline metals - щелочные металлы

photoemissive cell - фотоэмиссия, элемент с внешним фотоэф-

фектом

incident light - падающий свет

to excite - возбуждать

GRAMMAR EXERCISES

I. *Find the sentences with the Subjective Infinitive construction (Complex Subject) in the text and translate them.*

II. *Say if it is true or false.*

1. Electrons are orbiting around a central nucleus.
2. The total energy contained in any atom is known to be sum of the energies of the individual nuclei.
3. There are two basic laws of photoelectricity.
4. Light falling on the anode will cause electrons to be emitted.

III. *Translate the following sentences, pay attention to the Subjective Infinitive construction (Complex Subject).*

1. Electronics is thought to be a young science. 2. The electric generator is known to be a machine that converts mechanical energy into electrical energy. 3. Alpha rays are considered to be positively charged helium atom. 4. An electric cell is believed to consist of an electrolyte and two electrodes. 5. This voltage source was supposed to supply current for this circuit. 6. The value of the output voltage of the cell was found to depend only on the material used. 7. Due to these experiments this substance was shown to be a good conductor. 8. The secondary coil of the transformer is assumed to have more turns than the primary one. 9. Cadmium was reported to be useful for application in transistor. 10. This scientist is expected to make a report on the fundamentals of radio engi-

neering. 11. The designer is said to construct a new device by using semiconductors.

IV. Translate the following sentences, pay attention to the Complex Subject.

1. Yablochkov is known to be the inventor of the electric candle! 2. All the members of the committee are reported to have been enthusiastic about the plan. 3. "Hamlet" is considered to be the summit of Shakespeare's art. 4. Substances are known to burn when they unite with the oxygen of the air. 5. The years that he had spent abroad seemed to have taught him much. 6. He is supposed to be one of the greatest writers of our time. 7. It appeared to be quite another man. 8. Shakespeare is known to have been an actor and play writer in one of the leading companies of players at the end of 1580.

V. Point out the construction "for+Infinitive". Translate the following sentences.

1. On completion of a contract of long duration it is a sound policy for the plant to be sent to the repair depot for thorough examination. 2. Architecture is a difficult art, for it requires a special type of imagination and takes long years of training and experience to produce a capable architect. 3. In pushing over or falling trees, which are too large for the tractor to move by blade, the roots of the trees should be exposed and cut through. 4. In its way the camera can be even more deceptive than a drawing for the good architectural photographer can make beautiful photographs of ugly structures. 5. The six rivets necessary for the web connection to be able to take up the design shear are arranged as shown.

VI. Translate the following sentences, pay attention to the Infinitive.

1. Real water vapour and steam are known to be completely invisible. 2. A rod of ebonite, which has been rubbed with the wool rag, is found to have the property of attracting light objects such as small pieces of paper, cork, etc. 3. When heat is transferred from one part of the body to another without any progressive motion of the parts of the substance, the heat is said to be transferred by conduction. 4. A book lying on a table is expected to keep its position without any difficulty, as one knows

it to be in a state of equilibrium. 5. Heat is said to reach the cooler end of the rod by conduction along or through the material of the rod. 6. All metals are known to consist of minute particles called molecules.

VII. *Translate the following sentences, pay attention to the construction "for+ noun+ Infinitive".*

1. 8 minutes are required for light to travel from the Sun to the earth. 2. Nearly a month is required for the moon to circle the Earth. 3. The satellite of Neptune is too far away for its size to be known with any accuracy. 4. For combustion to be rapid, the fuel and oxidant must be quickly mixed. 5. For ions to be formed, a considerable amount of energy must be given to the parent atoms. 6. In order for the airplane to climb, thrust must exceed drag.

VIII. *Translate the additional text into Russian in written form.*

THE GRADUAL GROWTH OF OUR KNOWLEDGE OF ELECTRICITY

As long as 600 B.C. (**до нашей эры**) the Greek philosopher Thales knew that amber rubbed with fur or wool would attract small pieces of straw and other light materials. The Greek also knew that certain rocks of iron ore would attract small pieces of iron.

This was also known to the early Chinese who used this knowledge to make a magnetic compass — a special iron needle that is free to rotate in any horizontal direction. The needle is so attracted by the natural magnetism of the earth that it always turns to point with certain accuracy towards the north. The compass made navigation of the ocean simpler and safer. One of the first books showing the connection between magnetism and electricity, based upon actual experiments was written by Dr. William Gilbert in 1600. It was generally thought that there were two different kinds of electricity: frictional and static electricity — the kind you make when amber is rubbed with wool — and kind stored in a cell that can be changed into electric current. Now we know the two kinds are the same.

UNIT 2

Текст: ATOM AND ELECTRON.

- Перевод причастия I, II в функции определения и обстоятельства.
- Перевод многофункциональных служебных слов *it, one*.

Трудности перевода *Participle I, II*

При переводе причастия возникают трудности, которые связаны с омонимическими формами *Past Indefinite* и *Participle II* неличных глаголов.

Особое внимание следует обратить на причастие в функции определения, которое стоит после существительного. В этой функции чаще всего встречается причастие II, реже причастие I.

Cosmic rockets launched with the first space velocity (7.9 km per sec.) become artificial satellites.

Космические ракеты, запускаемые с первой космической скоростью (7,9 км/с), становятся искусственными спутниками Земли.

Сложная форма *Participle I (being used)* в функции определения, как правило, переводится причастием настоящего времени в страдательном залоге или придаточным определительным предложением.

Rockets being used for high altitude research are equipped with special instruments.

Ракеты, которые используют для проведения исследований на большой высоте, оборудованы специальными приборами.

Перевод многофункциональных служебных слов *it, one*

It употребляется как:

а) личное местоимение (он, она, оно) для неодушевленных предметов:

Finally I found the article I had been looking for. I started translating it at once.

Наконец я нашел статью, которую искал. Я сразу же начал переводить ее.

б) формальное подлежащее в безличных предложениях.

It is well known that radioactive isotopes can be used very effectively in medicine.

Хорошо известно, что радиоактивные изотопы можно очень эффективно использовать в медицине.

в) указательное местоимение:

What is it? — Что это? It is a lamp. — Это лампа.

г) вводное слово в предложениях с эмфатическим оборотом:

It is silver that is the best conducting metal.

Именно серебро является наилучшим проводящим металлом.

One употребляется как:

а) числительное:

I know only one solution of this problem.

Я знаю только одно решение этой задачи.

б) неопределенное местоимение:

One should know that geometry treats of the properties, construction and measurements of lines, surfaces and solids.

Необходимо знать, что геометрия рассматривает свойства, строение и измерение линий, поверхностей и твердых тел.

в) слово-заместитель для замены ранее упомянутого существительного:

This substance reacts 100 times as fast as the other one. Это вещество взаимодействует в 100 раз быстрее, чем другое.

Read the text.

ATOM AND ELECTRON

Present atomic theories, based on the atom model, place the mass and the positive charge of an atom in a central nucleus, surrounded by moving electrons. The nucleus is composed of neutrons and protons. Neutrons have a mass approximately one-sixteenth that of the mass of the oxygen atom and have zero electrical charge. They occur in fixed numbers in all nuclei except that of hydrogen H. The proton has a mass slightly lighter than that of the neutron and approximately equal to the mass of the hydrogen H. It is a charge equal to that the electrons but positive in sign. The chemical elements are differentiated by varying numbers of protons and neutrons in the nucleus, number of protons being

equal to the atomic number, hydrogen having one, helium two, and so on. Since atom is in electrical balance in its normal state, the number of associated electrons moving around the nucleus is equal to the numbers of protons.

The electron is the smallest known indivisible unit of electric charge. Early experimenters succeeded in the measuring the ratio of the charge of the electron to mass, and in 1910 the charge was first measured, thus determining these properties of the electron. Repeated experiments have defined the values for these constants of the electron.

The electron appears to have a dual personality, at time being best thought of as a particle, and in other experiments seeming to require wave properties for a satisfactory explanation of the phenomena.

Electric current is due the movement of electric charges, frequently referred to as electrons. However, long before the existence of the electron was known, it was customary to speak of electric current as due to movement of positive charges from positive to negative in a metallic circuit external to the source. This usage is too well set to be readily overcome, even though it is now known to be reversed, with the negative electrons moving from negative to positive in the external metallic circuit. Therefore, when electric currents are discussed, the customary direction will be meant.

Vocabulary notes

neutron - нейтрон

proton - протон

associated electrons - связанные электроны

indivisible - неделимый

coulomb - кулон

The electron appears to have a dual personality - оказывается, что электрон обладает двойственной природой.

This usage is too well set to be readily overcome - это настолько прочно вошло в привычку, что от нее нелегко отказаться.

reversed - противоположный

due to - обусловленный

to refer to - относить, иметь отношение

in sign – по знаку

the ratio - пропорциональность

customary - **обычный**

GRAMMAR EXERCISES

I. *Name the forms of the Participle, define their functions and translate the sentences.*

1. Having lost the address of her cousin's new flat, she couldn't come to see her. 2. The site having been chosen, many houses are being built there. 3 He lost his way and not knowing English he couldn't get to Capitol Hill. 4. He got to Capitol Hill having changed a tram for a bus. 5. Asked in English transmitting he couldn't answer anything. 6. The site of the city was chosen by G. Washington and was accepted by Congress in the act of 1790, establishing the Federal District of Columbia.

II. *Define the functions of the Participle I in Passive Voice and translate the sentences.*

1. Being heated magnetized steel loses its magnetism. 2. The new measuring instrument being developed in this laboratory will be tested by that engineer. 3 The oscillations being produced in the antenna are, weak. 4. New data being obtained are necessary for nature investigations. 5. Being perfected the device operated successfully under all conditions. 6. The new receiver being tested will be used in this system. 7. Being equipped with modern instruments the laboratory carried out important experiments.

III. *Translate the following sentences, pay attention to the Participle II.*

1. The operation of the receiving station influenced by a number of factors was discussed by engineers. 2. The generation of electricity from magnetism dealt with by Faraday was a very important scientific discovery. 3. The work of Rutherford followed by great help for understanding many natural phenomena. 4. Gagarin's first space flight' followed by many others was very important for the development astronautics. 5. Molecules of even a good insulator acted upon by electric field produce a motion of electrons due to the field. 6. Some drawbacks of the reactor referred to in this article will be eliminated.

IV. TRANSLATE THE ADDITIONAL TEXT INTO RUSSIAN IN WRITTEN FORM.

WHAT IS ELECTRONICS?

First, let us look a little deeper into what electronics really is.

Electronics is a young science. It belongs to the twentieth century, although many of the mathematical aspects of it were worked out in the latter part of the nineteenth century. It really began when the valve was invented. It was forgotten during the rapid development of wireless, although in laboratories here and there men were experimenting with devices which we now class as electronic, such as X-rays and "cathode" rays. The word "electronics" means "to do with electrons", and as people began to realize that the streams of electrons in valves could be made to do more than just receive and amplify wireless signals, great advances were made and electronic vacuum tubes began to be used in many ways quite unconnected with wireless.

We cannot say exactly what an electron is or what it is like because it is far too small to see with even the most powerful microscope. We can only observe the effect it produces under given conditions and infer from this its general properties. We can say that it is the smallest known particle that exists and a tiny piece of negative electricity. Much of our information about it has been derived from the study of large groups or streams of electrons; and has thus been applied to the behaviour of crowds rather than the character of individuals.

Basically, electronics is not so much a new subject as a new way of looking at electricity. All electrical effects are really electronic, because all electric currents result from the movement of electrons, and all electric charges are due to the accumulation of electrons. The most convenient way of defining what we call "electronics" today is to say that it is concerned with electrons which are free, in so far as they are not limited to the confines of solid wires or conductors. It concerns chiefly the passage through a vacuum or gas-filled space, such as is contained within the familiar radio and television valves.

V. *Define the functions of "one" and translate the sentences into Russian.*

1. One watt is the power due to a current of one ampere at tension of one volt; therefore watts equal volts time amperes. 2. When one talks over a telephone, it is not the sound of the voice that travels over the wire, it is an electric current. 3. When put together in a molecule, these tiny fragments do not form a rigid structure, but one that can vibrate, rotate and perform other relative motions about its centre of mass. 4. From of this experiment it is clear that these devices are low power ones. 5. One would like to know, for example, that the effect of the ambient atmosphere is on the slow-state density and energy distribution. 6. The relative motion of one tooth upon the other should be more of a rolling than of a sliding nature. 7. The rum indicator and the ball-bank indicator were constructed in one housing to provide a more efficient instrument for flight. 8. One of the most important things for the pilot to know is how high he is flying. 9. One should know that geometry treats of the properties, construction, and measurements of lines, surfaces and solids.

UNIT 3

Текст: ELECTROMAGNETIC WAVES.

- Перевод самостоятельного причастного оборота
- Перевод многофункциональных служебных слов: *there, that,*

but.

Перевод самостоятельного причастного оборота

(The Absolute Participial Complex)

Этот причастный оборот состоит из существительного в «об- щем» падеже или местоимения в именительном падеже и прича- стия.

Самостоятельный причастный оборот отделяется запятой от главного предложения и переводится на русский язык:

а) придаточным обстоятельственным предложением, которое вводится одним из подчинительных союзов «когда», «так как» (ко- гда оборот стоит в начале предложения);

б) самостоятельным предложением, которое вводится в состав сложносочиненного предложения одним из сочинительных союзов

«и», «а», «причем» (когда независимый причастный оборот стоит в конце предложения).

The gas being compressed, the number of molecules in each cubic centimeter is increased.

Если газ **сжать**, количество молекул в каждом кубическом сантиметре увеличивается.

All gases and liquids expand when heated their density being at the same time reduced.

При нагревании все газы и жидкости расширяются, причем их плотность одновременно **уменьшается**.

Самостоятельные причастные обороты широко используются в технической литературе и иногда начинаются предлогом *with*. На русский язык предлог не переводится, а весь оборот соответствует придаточному или самостоятельному предложению.

With the experiments having been carried out, we started new investigations.

После того, как были **проведены** эксперименты, мы начали новые исследования.

Перевод многофункциональных служебных слов: *there, that, but*

There употребляется как:

а) формальное подлежащее в конструкциях типа *there is, there are*:

There are two other reasons for the use of another relay.

Для использования такого реле **существуют** две другие причины.

б) наречие:

We made experiments there.

Мы проводили опыты **там**.

That употребляется как:

а) указательное местоимение:

At that point the line drops down to zero.

В той точке линия падает до нуля.

б) союз:

He showed that any two masses attract each other.

Он доказал, **что** любые два тела, имеющие массу, притягиваются.

в) союзное слово:

Give us a material that can withstand very high temperature.

Дайте нам материал, **который** может выдержать высокую температуру.

г) слово-заместитель, для того чтобы избежать повторения существительного:

The qualities of the new alloy are better than those of the old one.

Качества нового сплава лучше **качества** старого (сплава).

But употребляется как:

а) союз (но, а):

Kinetic energy is the energy of motion, but potential energy is that of position.

Кинетическая энергия — это энергия движения, **а** потенциальная — энергия покоя.

б) наречие (только, лишь):

He is but a child.

Он **только** ребенок.

в) предлог (кроме):

For some minutes we could see nothing, but black smoke rising from the ground.

В течение нескольких минут мы ничего не видели, **кроме** черного дыма, который поднимался от земли.

Read the text.

ELECTROMAGNETIC WAVES

The conversion of sound waves into electric currents and the amplification of these currents are two basic electronic techniques required for record players, different electronic techniques.

There are many reasons why it is not practically to transmit radio waves of very low frequencies, but for one thing the transmitting aerial will be impossibly large. It is therefore not possible to broadcast electromagnetic waves of audio frequencies, and for long-distance transmission it is necessary to resort to higher frequencies and therefore shorter

wavelengths; the wavelengths actually used vary about 1 meter to 2000 meters.

In general, electromagnetic waves are propagated through the Earth's atmosphere in two ways: travel over the surface of the Earth, and waves, which leave the surface of the Earth. They are reflected back ionized layers of the outer atmosphere between 60 and 400 kilometers above the Earth's surface. This ionized region of the atmosphere is called ionosphere.

Long waves are transmitted as over ground waves and therefore lose a good deal of their energy in passing through ground obstacles; they consequently have only a limited range. The shorter waves escape more easily from the surface of the Earth. They can be received over greater distances owing to their reflection back to the Earth by the ionosphere. Very short waves pass through the ionosphere so they can be used for long-distance communications. This is why the range of TV stations is limited. This problem has however been overcome in recent years by the use communication satellites. If the satellite simply reflects the radiation, it is called a passive satellite, where as it receives the signal and retransmits an amplified signal, it is called an active satellite.

Vocabulary notes

amplification - усиление

but for one thing - но, во-первых

obstacle - препятствие, помеха

This problem has, however, been overcome — однако эта проблема была решена

to transmit - передавать

to resort - обращаться за помощью

to propagate - распространять(-ся)

to reflect - отражать

satellite - спутник

an amplified signal - усиленный сигнал

GRAMMAR EXERCISES

1. *Insert the appropriate forms of the Participle from the brackets; translate the sentences.*

1... the position of the plant on paper, it was decided that the pipeline should go along the river (establishing, having established). 2... at the object from the front, or from the sides, the observer could not see the inside edges of the object (looking, having looked). 3... to the table it will be noted that the number of loads hauled by the wheeled tractor are more than that of a crawler tractor on a similar length of haul (referring, having referred). 4. ... the number of loads hauled per hour, the total cubic yards of material excavated may be easily calculated (knowing, having known).

II. *Translate the following sentences, pay attention to the Absolute Participial Complex.*

1. Electrons moving through the conductor, electrical energy is generated. 2. The speed of light being very great, we cannot measure it by ordinary methods. 3. Transistors being very sensitive to light, engineers use this property. 4. The current in a circuit was decreased when the resistance was increased, other factors remaining the same. 5. Some radioactive materials have been found in nature, uranium being one of them. 6. Chemistry and physics are interconnected sciences, any chemical change resulting in a physical change. 7. The value of voltage was the same in all the elements of a parallel circuit, the value of current being different. 8. A charge of one coulomb increasing the potential between plates by one volt, a capacitor had a capacity of one farad. 9. The resistance of the body being high, small current flows through the body. 10. Territs are very sensitive to light, this property being very important.

III. *Define the Absolute Participial Complex and translate the sentences into Russian.*

1. There being no other traffic, the driver can maintain a constant speed of, say, 90 km/hr (kilometers per hour). 2. Part of energy being changed into heat is transformed into electric energy. 3. The water leaves the wheel with a large relative velocity but a small absolute velocity, practically all its original energy having been given to the wheel. 4. The cyclotron may be regarded as a modification of the linear accelerator, the particles being transferred from one to the other at the proper instants by the action of a magnetic field. 5. The positive pole having been brought near the negative pole, the latter attracts it. 6. Two bodies having poten-

tials of 100 volts and 50 volts, a potential difference exists between them of 50 volts. 7. The current distribution over the cross section of the conductor being non-uniform, the resistance increases. 8. The travelled distance having been given in meters and the time in seconds, speed was measured in m.p.s., that is, in meters per second.

IV. Translate the following sentences into Russian, pay attention to the functions of the Participle II.

1. Both apparatus are equipped with a rubber-insulated conductor. 2. The advantage of the diesel engine lies in the high efficiency obtained. 3. There was the great increase of the quantity of part produced. 4. The uranium must be enclosed in a thick metal case to prevent it from flying until the explosion is under way. 5. The number of metal atoms, deposited on a plate depends on the number of electrons arriving at the plate. 6. Carbon was the first material used for such a conductor. 7. The fastest way to detect an artificial satellite is radio, largely used for that purpose. 8. The mechanical and electrical apparatus needed for testing are incorporated in a stable steel housing.

V. Translate the following sentences, pay attention to the Absolute Participial Complex.

1. The fundamental of electricity are the fundamentals of electronics, both being branches of physics. 2. The condenser being placed in a direct currents circuit, the current will stop flowing. 3. The velocity, length and frequency of the wave are independent of each other, the frequency being equal to the velocity divided by the wavelength. 4. The size of the electrodes being increased, the current capacity also increases, the voltage output remaining the same.

VI. Translate the additional text into Russian in written form.

NUCLEAR ENERGY

Utilization of atomic power has created a considerable revolution in the entire field of power engineering. The atom permits obtaining electric power in the places where coal or oil cannot be transported by conventional means.

Atomic power stations are successfully built in those places where supplies of organic fuels have been entirely exhausted or are near exhaustion.

The main and most wonderful feature of nuclear fuel is the enormous thermal energy it contains. Indeed, one kilogram of nuclear fuel is equal to more than 2,000 tons of coal. Mention should be made that no other branch of technology has progressed as fast as nuclear power engineering.

The construction of atomic power stations equipped with the so-called "fast" reactors is the basic trend in the further development of power engineering.

VII. *Translate the following sentences, pay attention to the different meanings of "but".*

1. It seems that the electron is nothing but electricity. 2. If but a few of the atoms of a body have had an electron removed the body has a small charge. 3. One can easily note how voltage increases during the first quarter-turn but then decreases during the next quarter turn. 4. The operator saw all the tubes but one function in the proper way. 5. We expect the current cycle and the voltage cycle to finish in step if they start in step. But in many a.c. circuits the current cycle does not get started as soon as the voltage cycle.

VIII. *Translate the following sentences, pay attention to the different meanings of "that (those)".*

1. The initial conditions in the electrical problem can be made the same as those in the mechanical problem. 2. Let us now obtain a more general formula that simplifies heat-conduction problems. 3. A concentrated force is a force that is applied on a point. 4. The necessary conditions for equilibrium in a system of forces are that the algebraic sum of all the force components in any direction must equal zero. 5. Normal stresses are those produced by tension and compression and are distributed on a plane perpendicular to the line of action of the external load reaction. 6. Hooke's Law states that a body acted upon by an external force has a deformation proportional to the stress, as long as the elastic limit is not exceeded. 7. A tool or machine must never be used for any purpose other than that for which it is intended.

IX. Translate the following sentences, pay attention to the different meanings of "there".

1. There can be no flow of water through a pipe unless there is pressure to cause it. 2. There will also be some pulsation as the brush bridges the insulated gap between two segments. 3. There will be exactly as many numbers current cycles as there are voltage cycles, but they may start at different times. 4. While these condensers will be found usually in direct current circuit, there is one type that is used on alternating currents for motor starting and the like. 5. There are two methods of storing an equal amount of energy in a condenser. 6. There are many different kinds of reactors varying in size, in the type of fuel used, and in the quality of fuel.

UNIT 4

Текст: SEMICONDUCTORS.

- Перевод герундия и герундиальных оборотов.
- Перевод разных случаев употребления многофункционального глагола *to do*.

Перевод герундия и герундиальных оборотов

Герундий – это неличная форма глагола, которая образуется прибавлением окончания *-ing* к инфинитиву.

Герундий имеет следующие формы:

	Indefinite	Perfect
Active	<i>Writing</i>	<i>Having written</i>
Passive	<i>Being written</i>	<i>Having been written</i>

Форма герундия совпадает с формой причастия I, но от причастия I герундий отличается следующими признаками:

1. Перед герундием стоит предлог, существительное в родительном падеже или притяжательное местоимение.

For converting electrical energy into mechanical energy we used a special machine.

Для превращения электрической энергии в механическую энергию мы использовали специальную машину.

2. Герундий отличается от причастия | синтаксическими функциями. Он может выполнять не только функции определения и обстоятельства, но и функции подлежащего и дополнения.

Heating the substance at high temperatures may change its properties.

Нагрев(ание) вещества при высоких температурах может изменить его свойства (подлежащее).

3. В функциях обстоятельства герундий всегда употребляется с предложением.

He insists on using this substance in the experiment.

Он настаивает **на использовании** вещества в эксперименте (дополнение с предложением).

Поскольку в русском языке нет формы, соответствующей английскому герундию, то при переводе на русский язык ему надо найти соответствующие эквиваленты.

Герундий может переводиться:

• существительным:

Measuring resistance before the beginning of the experiment was necessary.

Измерение сопротивления перед началом эксперимента было необходимо.

• инфинитивом:

The English realists sought for new ways and means of revealing the truth of life.

Английские реалисты искали новые пути и способы **показывать** правду жизни.

• деепричастием:

Heat may be produced by burning coal, gas or any other fuel.

Тепло можно получить, **сжигая** уголь, газ или любое другое топливо.

• глаголом в личной форме как сказуемое в придаточном предложении:

I remember their having adopted this system as being more economical.

Я помню, что они **одобрили** эту систему как более экономичную.

Из сложных форм герундия в научной и технической литературе чаще всего, встречается герундий в форме страдательного залога. *Passive Gerund* указывает на то, что действие, выраженное герундием, совершается над лицом (или предметом), к которому оно относится:

The possibility of chemical energy being transformed into energy is evident.

Возможность **превращения** химической энергии в электрическую энергию очевидна.

Герундиальный оборот — это сочетание герундия с дополнением и присоединенными к нему словами, может выполнять любые функции (кроме определения).

In spite of not having any university education, Faraday made his great discoveries.

Несмотря на то, что Фарадей **не имел** университетского образования, он сделал великие открытия.

Часто перед герундием стоит притяжательное местоимение или существительное в притяжательном падеже. Такие элементы предложения вместе с дополнением и обстоятельством образуют герундиальный оборот. Притяжательное местоимение или существительное герундиального оборота переводится личным местоимением или существительным в именительном падеже и выполняет функцию подлежащего русского придаточного предложения, а герундий переводится глаголом в личной форме.

Einstein's being awarded the Nobel prize in physics soon became widely known.

То, что **Эйнштейн был награжден** Нобелевской премией по физике, вскоре стало широко известным фактом.

Если герундий стоит в начале предложения и выполняет функцию подлежащего, то он переводится отглагольным существительным или инфинитивом.

Heating copper from 0° to 100° C increases its resistance about 40%.

Нагревание меди от 0° до 100° C увеличивает ее сопротивление на 40%.

Measuring resistance is necessary in many experiments.

Измерить сопротивление необходимо во многих экспериментах.

В научно-технической литературе часто употребляется герундий с оборотом *there is (are)*. В этих случаях герундий переводится на русский язык существительным или личной формой глагола.

*There was **no** absorbing gas on the surfaces of solids.*

На поверхности твердых веществ газ **не абсорбировался**.

Перевод разных случаев употребления многофункционального глагола *to do*

Глагол *to do* в предложении может быть:

1. Смысловым глаголом со значением «делать».

Scientist did everything to improve the method of measurement.

Ученые сделали все, чтобы улучшить метод измерения.

2. Вспомогательным глаголом для образования вопросительной и отрицательной формы в *Present* и *Past Indefinite*.

What does our Government do it in order to supply water to dry regions?

Что **делает** наше правительство для того, чтобы поставлять воду в засушливые районы?

*He **didn't** know about this important experiment.*

Он не знал об этом эксперименте.

3. Глаголом для усиления значения действия, выраженного глаголом-сказуемым. В этом случае перед смысловым глаголом стоит *do (does)* в настоящем времени и *did* - в прошедшем. Усиление значения передается в русском языке частицами «же», «ведь», словами «фактически», «действительно» и др.

Now, we do understand what great importance the computer has in our life.

Теперь мы **действительно** понимаем, какое большое значение имеет компьютер в нашей жизни.

4. Глаголом для замены смыслового глагола во избежание его повторения. В этом случае *to do* стоит в том же времени, что и смысловой глагол и переводится тем же смысловым глаголом или совсем не переводится.

Perhaps you are wondering that such an atomic power station might explode as a bomb does.

Возможно, вы удивляетесь, что такая атомная станция могла взорваться как бомба.

Read the text.

SEMICONDUCTORS

The term "semiconductor" means "half-conductor", that is, a material whose conductivity ranges between that of conductors and non-conductors or insulators.

They include great variety of elements (silicon, germanium, selenium, phosphorus and others), many chemical compounds (oxides, sulphides) as well as numerous ores and minerals.

While the conductivity of metals is very little influenced by temperature, conductivity of semiconductors sharply increases with heating and falls with cooling. This dependence has opened great prospects for employing semiconductors in measuring techniques.

Light, as well as heat, increases the conductivity of semiconducting materials, this principle being used in creating photo resistances. It is also widely applied for switching on engines, for counting parts on a conveyer belt, as well as various systems of emergency signals and for reproducing sound in a cinematography. Besides reacting to light, semiconductors react to all kinds of radiations and they are therefore employing in designing electronic counters.

Engineers and physicists turned their attention to semiconductors more than fifty years ago, seeing in them the way of solving complicated engineering problems. Converting heat into electricity without using boilers or other machines was one of them. This could be done as means of metal thermocouples, but in this way impossible to convert more one per cent of the heat into electricity. The thermocouples made later of conductors more generated ten times as much electricity as the metal ones.

Sunlight like heat can feed our electric circuit. Photocells made of semiconducting materials are capable of transforming ten per cent of sunray energy into electric power. By burning wood, which has accumu-

lated the same amount of solar energy, we obtained only heat fractions of one per cent of electric power.

The electricity generated by semiconductor thermocouples can produce not only heat but also cold, this principle being used in manufacturing refrigerators.

Semiconducting materials are also excellent means of maintaining a constant temperature irrespective of the surrounding temperature changes. The latter can **vary over a wide range, for example, from 50° below 0° to 100° above 0°**.

Semiconductors are the youngest field of physical science. Yet even now they are determining the progress of radio engineering, automation, chemistry, electrical engineering and many other fields of science and technique.

Vocabulary notes

semiconductor - полупроводник

conductivity - проводимость

to range between - колебаться (в пределах)

oxide - оксид

sulphide – сульфид

ore - руда

emergency signal - аварийный сигнал

to turn one's attention (to) - обратить **че-либо** внимание (на что-то)

insulator - изолятор

silicon - кремний

coating parts - элементы покрытия

GRAMMAR EXERCISES

I. *Make up different kinds of questions to the following sentence.*
Light increases the conductivity of semiconducting materials.

II. *Answer the questions.*

1. **What does the term “semiconductor” mean?**
2. When does conductivity of semiconductors sharply increase?
3. Can sunlight like heat feed our electric circuit?

4. Can the electricity generated by semiconductor thermocouples produce heat or cold?

5. Semiconductors are the youngest field of physical science, **aren't they?**

III. *Find the verbals in the text and analyze them.*

IV. *Translate the following sentences, pay attention to the functions of the Gerund:*

1. Increasing the number of power stations in our country means the improving living standards of people. 2. Testing a new receiver for the application in the system was the prime task of the laboratory. 3. The new means of improving radio communication has been discovered by our engineers. 4. Iron and zinc plates are used for producing negative electrodes since these materials produce a high charge. 5. Important results on the ionization were obtained by measuring those particles. 6. In designing electronic computers we have passed from valves to transistors. 7. The transistors are successfully used for transforming heat energy into electrical energy by means of thermal elements. 8. Without increasing the temperature of metals it is impossible to increase their resistance. 9. Radiation is usually detected by measuring the amount of ionization. 10. After investigating many materials engineers selected aluminium for constructing this device. 11. By raising the cathode temperature we increase the number of emitted electrons.

V. *Translate the following sentences, pay attention to the Gerundial Constructions.*

1. We know of all substances consisting of atoms. 2. We knew of glass having been invented some hundreds years ago. 3. Every student knows of copper being one of the first metals used by man. 4. The explanation lies in the product being more stable. 5. We insisted on their being offered favourable terms of payment. 6. The possibility of ethylene being converted into aromatic hydrocarbons is slight. 7. We object to their being denied the aspiration to test such new methods as may be suggested by fresh knowledge. 8. He objected to the goods being paid in advance.

VI. *Translate the following sentences, observe different meanings of the verb to do.*

1. When the molecule is placed in the electric field, the electrons try to move and do so for instant. 2. If only a few of the insulator's molecules do release one electron each, the insulator at once completely breaks down and becomes a conductor. 3. If by some means we can change the current in a coil without changing the flux rapidly, then the current may rise and fall as suddenly as it does in a purely resistive circuit. 4. The electrons, the motion of which constitutes the current, do not actually pass from one plate of the condenser to the other through the dielectric. 5. An important question for the radio engineer to consider has to do with the shape of current, which flows in a circuit connected to an alternator. 6. The emission or evaporation of electrons takes place at lower temperatures than does that of atoms.

VII. *Translate the sentences with Gerund into Russian.*

1. Production control methods involve planning.
2. **Understanding requires the reader's attention.**
3. Accounts area is concerned with handling financial operations.
4. The company cut costs by shifting production to cheaper locations.
5. Granting credit always implies some degree of risk.
6. Managing stock and work in progress is achieved by using special 80/20 rule.
7. Accuracy in invoicing should be aimed for.
8. **Every communication applies to a person's mind to accepting** more information.
9. The purpose of advertising may be anything from increasing brand awareness to improving specific aspects of the brand image.
10. Sometimes it is worth including questions themselves as sub-headings in the text.

VIII. *Complete the sentences choosing Gerunds from the list.*

breaking up, getting, giving, charging, maintaining, reading, handling, selling, showing, describing.

1. Advertising is a very important part of _____ to the customer on order to create favourable prejudice.

2. _____ even a simple object to someone who has never seen it can be very difficult.

3. One of the fundamental aids to affective _____ is the making of notes.

4. The idea of marketing should use all its efforts to _____ the customers what they want, at a profit.

5. The process of marketing includes a whole range of activities relating to _____ the product.

6. _____ more for products or services seems a relatively easy way to improve results.

7. Accounts area is responsible for _____ the financial side of the business operations.

8. Stock control area is concerned with _____ a current up-to-date list of inventory of stock held by a business.

IX. Translate into Russian, paying attention to the -ing forms.

1. One of the most outstanding advances has been the use of computers in simulating management problems. 2. One major institution is now working on a program for adapting this new system to the problem of planning. 3. Special-purpose computers are already controlling irk power-generating stations. 4. The beginning of a manufacturing process is normally product design. 5. Naturally, in introducing at integrated manufacturing system of any sort, there is a great deal of resistance to change on the part of all concerned.

X. Translate the additional text into Russian in written form.

CONDUCTORS

Conductors are materials having a low resistance, so that current easily passes through them. The lower is the resistance of the material, the more current can pass through it.

The most common conductors are metals, and silver and copper: are the best of them. The advantage of copper is that it is much cheaper than silver. Thus, copper is widely used to produce conductors. One of the common functions of wire conductors is connecting voltage source to a load resistance. Since copper wire conductors have a very low re-

sistance a minimum voltage drop is produced in them. Thus all of the applied voltage can produce current in the load resistance

Most materials change the value of resistance when their temperature changes.

UNIT 5

Текст: COMPUTER.

- Перевод отглагольного существительного.
- Перевод конструкции с предлогом *for*.

Перевод отглагольного существительного

В английском языке отглагольное существительное (*The Verbal Noun*) по своей форме совпадает с *Participle I* и *Gerund* (окончание *-ing* прибавляется к основе инфинитива). Отглагольное существительное можно определить по таким признакам:

1. Наличие артикля.

Many metal working processes include the melting or solidifying of metal.

Многие металлообрабатывающие процессы включают **плавление** или **отверждение** металла.

2. Наличие окончания множественного числа.

It was necessary to change temperature readings from one temperature scale to another.

Необходимо было изменить **показатели** температуры с одной температурной шкалы на другую.

3. Определение стоит перед отглагольным существительным.

I like rapid reading.

Мне нравится быстрое **чтение**.

4. Определение с предлогом *of* стоит после отглагольного существительного.

They started the loading of the ship.

Они начали **загрузку** корабля.

Перевод конструкции с предлогом *for*

For употребляется как;

а) союз (так как, ибо):

We shall go to the lecture on mechanics, for it seems to be interesting.

Мы пойдем на лекцию по механике, **так как** она, кажется, будет интересной.

б) предлог (за, для, на, в течение, чтобы — инфинитивный оборот в с предлогом *for*):

The flare will burn for approximately 3 minutes.

Сигнальная ракета будет гореть приблизительно **в течение** трех минут.

Pistons for small engines are generally made of cast iron.

Поршни **для** малогабаритных моторов обычно изготавливаются из чугуна.

The smallest electric voltage is sufficient for the electrons to be set in motion.

Достаточно наименьшего электрического напряжения, **чтобы** электроны двигались.

Read the text.

COMPUTER

Computers are well known to represent a completely new branch of science, the first of them having appeared less than 60 years ago. Although still new, these machines are already bringing about a real revolution in science, technology, statistics and automatic control.

The reason for this is in the fact that a mathematical formula can be found for almost of all scientific and technical problems. They can be solved without a computer but it would require millions of arithmetical operations. No Wonder that many problems of exceptional importance remained unsolved for a long time, the volume of the calculations required being above human possibilities,

Electronic computer with a high speed can carry out several thousand arithmetical operations in one second. A calculation, which would have taken several year of intense human work in the past, is now done in a few minutes or hours.

A number of various complicated problems have already been solved with the help of computers.

The principle of this wonderful machine lies in counting electric impulses. Numbers are represented as a sequence of such impulses, and a radio-technical scheme counts them carrying out addition, subtraction, multiplication and division all higher mathematical calculations being reduced to these four operations.

If we introduce into the scheme first one number and then another, the result will yield the sum of these two numbers. Subtraction is reduced to the addition of negative numbers. Multiplication is done by repeated addition the necessary number of times, a division — by repeated subtraction.

Electronic machines work according to a program prepared in advance, which determines the sequence of operations. They have a very efficient electronic "memory" which stores the initial date, the intermediate numbers and final results as well as working commands given to the machine.

The electronic machine can also be used for controlling automatic production. Signals given by measuring instruments and controlling devices into the machine send the necessary commands to the control panel according to the program.

This machine can also be used to make translations from one language into another by converting words into figures and vice versa.

All the instruments invented up to now have served to save man's labour. But it is electronic computers the importance of which cannot be underestimated, that come to the help of the human brain, thus opening boundless possibilities.

Vocabulary notes

complicated - **сложный**

vice versa (лат.) - **наоборот**

to invent - **изобретать, создавать**

boundless - **безграничный, беспредельный**

addition - **сложение**

subtraction - **вычитание**

multiplication - **умножение**

to reduce - **уменьшить**

to yield - **уступать**

to underestimate - **недооценивать**

GRAMMAR EXERCISES

I. *Define the Verbal Noun and translate the sentences into Russian.*

1. This splitting of the hydrogen molecule is attended by the absorption of a large amount of energy. 2. The breaking of the circuit causes the magnetic field to disappear. 3. We know that the conversion of heat into chemical energy is reversed when the burning of coal converts chemical energy into heat. 5. Inductance is provided with the silver coating and capacitance by the inner and outer surface of this silver with the porcelain as dielectric. 6. The original reactor worked successfully at 200 watts and the shielding was not sufficient to allow a higher power level.

II. *Translate into Russian. Define the functions of the Participle, the Gerund and the Verbal Noun.*

1. When translated, the article was typed. 2. The results obtained were of great importance. 3. While compressing the gas we can turn it into liquid. 4. We are proud of being students. 5. He went away without waiting for a reply. 6 I remember my having seen this film. 7. This is a most interesting book, beautifully written and splendidly translated. 8. The melting of copper, iron and cast iron requires a very high temperature. 9. The energy of a body is its capacity for doing work. 10. It is interested in collecting rare minerals. 11. This article is worth reading. 12. At the continued heating of a solid body the movement of its molecules becomes still faster.

III. *Define the functions of the Participle, the Gerund and the Verbal Noun. Translate into Russian.*

1. The results obtained being of prime importance, engineers used them in their investigations. 2. Electrons are obtained by using a heated filament for the Negative electrode and protons are produced in a hydrogen-filled discharge tube from which ions pass to the main accelerating tube. 3. There are several types of microphones being used, the most important of these being the dynamic microphone, the velocity microphone and the crystal microphone. 4. Being built on the basis of transistors lasers are successfully used in technology. 5. The lead-acid battery employs a low-voltage constant potential charging arrangement, the lamps being connected in parallel. 6. The charge of the electron being deter-

mined, it was easy to calculate its mass, 7. The main advantage of this instrument over the moving coil type instrument is that it is capable of measuring both alternating current and direct current. 8. Obtaining new data on the device sensitivity will be of great help for designers. 9. The new, building housing the laboratory will be located at some distance from the main building of the plant. 10. The specific heat solid elements known, the approximate atomic weight can be easily calculated.

IV. Translate the additional text into Russian in written form.

THE ROBOTS NERVOUS SYSTEM

Robots, in order to perform many functions, need a nervous system and organs of sense as well as a brain. A human being has to have eyes and ears, a nose, a mouth, and a sense of feel. Depending on the task it is to perform, a robot can have any or all of these built into it.

A robot's eyes, for example, are generally made up of photoelectric cells. A robot eye can consist of one cell, or of hundreds of cells placed close together. A one-cell eye isn't able to do much more than tell the difference between light and dark, while some of the more complex ones are able to see colour and detect movement.

Robots can be taught to "hear" various types of sounds. Usually they are made so that they can "hear" only those sounds which are important to them. For instance, a robot designed to "hear" the sound of a jet aircraft would have no reason to hear the voice of a bird. Robot ears are better than human ears for a given single function because they are not distracted by unimportant sounds.

A robot can be adjusted to detect differences in frequency. If sounds of a given frequency are important to a robot's job, it acts on them. Otherwise the brain ignores the sound.

carries them. Robot noses are adjusted to analyze air passing through their "nostrils" and from the air composition tell what that air "smells" like.

Robots "feel" in the same way that humans do. Tiny wire "fingers" can go across a surface and, from the way the surface pushes the wires around, the robot can tell whether the surface is smooth or rough. Robots can also tell temperature. One kind of robot feeler is the thermostat which can tell the difference between two temperatures. Another kind of

robot heat sensor can feel the exact temperature more accurately than any thermometer. This device is called a "thermocouple". A thermocouple is based on the principle that electricity flows through a wire faster when it is cold than when it is hot. That is, the resistance in a hot wire is greater than it is in a cold wire. The needle on the meter will be at a certain place at any given temperature.

Robots seem human in many ways. They even have some feelings similar to human feelings. They occasionally have a nervous break down or they may grow tired. Much progress has been made in avoiding these "unwanted human" feelings in robots.

UNIT 6

Текст: LASERS.

Перевод предложений эмфатической конструкции.

Перевод конструкции *have + существительное + причастие II*

Перевод предложений эмфатической конструкции

Эмфатические конструкции употребляются для выделения того или иного члена предложения, которое может осуществляться с помощью инверсии.

Инверсия — изменение обычного порядка слов в предложении с целью выделения тех или иных его членов; нарушение обычного порядка слов, обусловленное логичными, стилистическими или ритмическими требованиями.

В английском языке можно наблюдать явление инверсии, когда сказуемое стоит перед подлежащим. Инверсия имеет особое смысловое значение и часто употребляется для выделения слова.

Существует несколько типов инверсии.

1. В начале предложения может стоять вторая часть сказуемого (*Participle I, II*), существительное с предлогом или прилагательное, затем первая часть формы глагола *be (is, are)* и, наконец, подлежащее. Между второй и первой частями сказуемого могут стоять прямое дополнение или обстоятельство.

The fundamental principles of alternating current are presented in this chapter. Included are the basic principles of some alternating current machines.

В этой части представлены основные принципы (свойства) переменного тока. Здесь же изложены **основные принципы действия некоторых двигателей переменного тока.**

2. В начале предложения может стоять обстоятельство со словами: *only*—только, *never before*—никогда раньше не, *no longer*—больше не, *not until* — только после, до (тех пор) пока не.

В этом случае инверсию употребляют для выделения этих слов и связанного с ними сказуемого.

Never before has a new class of weapon been attended so much publicity as a guided missile.

Никогда раньше ни один новый вид оружия **не привлекал** такого большого внимания, как управляемая ракета.

3. В предложении с инверсией на первом месте может стоять один из союзов *nor, neither, so*.

Carbon dioxide does not burn, nor does it support combustion.

Двуокись углерода не горит **и не поддерживает** горение.

4. На первом месте в предложении может стоять прилагательное, за которым следуют союзы *as* или *though*.

This new branch of science, young as it is, touches on many important practical applications.

Эта новая отрасль науки, **хотя она и возникла недавно**, лежит в основе многих важных практических применений.

Перевод конструкции have + существительное + причастие II

В английском языке есть конструкция, состоящая из глагола *to have* (в личной или неличной форме), за которым следует существительное и причастие II.

Some airplanes have engines installed in the wings.

На некоторых самолетах **двигатели устанавливаются** в крыльях.

В таком предложении существительное-подлежащее при переводе ставится в косвенном падеже, часто с предлогом (на самолетах), первый член конструкции — глагол *to have* — отдельным сло-

вом не переводится, второй член конструкции — существительное (*engines*) становится подлежащим, а третий член конструкции — причастие II (*installed*) переводится личной формой глагола.

Read the text.

LASERS

A device that has received a great deal of publicity is the laser (Light Amplification by Stimulated Emission of Radiation). This device produces a beam, of light composed of waves that are both monochromatic (all of one wavelength) and coherent (all in the same phase — that is, all the peaks coinciding). These properties enable the beam to be used as a source of considerable energy at a sharply defined point, for welding, eye surgery, and similar applications. Because the beam is also, extremely parallel, diverging very much less than ordinary light, it is used in space communications — a laser beam that has travelled the quarter of a million miles to the moon is still narrow enough to be useful.

The principle on which the laser works derives from an earlier device called the maser, which operates at microwave frequencies rather than optical frequencies. This principle is based on simulated emission, that is, the emission of a photon by an atom in an excited state as the result of the impact of a photon from outside of exactly equal energy. In this way the stimulating photon is augmented by the photon from the excited atom.

Thus if an atom in a substance is excited it will emit a photon to bring it back to the ground state. It is stimulated (hit) by a photon containing energy, equal to the difference between the excited and ground states. If a high proportion of the atoms in a substance is pumped to an excited state there is an avalanche effect. A stimulating photon from outside is doubled the first time it hits an excited atom, the two photons resulting then go on to double again by impacts with other excited atoms, and so on. All the photons have exactly equal energy, and are therefore associated with waves of identical wavelength.

A laser consists of a solid or gaseous active medium in which the majority of the atoms can be pumped to an excited state by exposing them to electromagnetic radiation of a different frequency to the stimulating frequency. The active medium consist of (or in the case of a gas is

contained in) a transparent cylinder which acts as a resonant cavity – the stimulated waves of the same frequency making repeated passages up and down the cylinder. One end of the cylinder has a reflecting surface, and the other has a partially reflecting surface through which the laser beam emerges.

In a ruby laser, for example, the electrons in the chromium atoms of a cylindrical ruby crystal are pumped to an excited level by radiation from a flash tube, thus producing a pulsed beam. Continuous wave lasers can be made using mixtures of inert gases.

Vocabulary notes:

monochromatic - **монохроматический**

coherent - **когерентный**

that is, all the peaks coinciding – **то есть, все пики совпадают**

to enable the beam to be used – **давать возможность использо-**

вать луч

to diverge – **расходиться (о лучах)**

frequency - **частота**

to augment – **увеличивать**

ground state – **основное состояние**

avalanche effect – **«эффект лавины»**

two photons resulting then go on to double – **вследствие этого,**

два фотона продолжают удваиваться

GRAMMAR EXERCISES

I. *Say if it is true or false.*

1. The beam of the laser is used as a source of considerable energy at a sharply defined point. 2. The principle on which the laser works is based on stimulating emission. 3. A laser consists of a solid or gaseous active medium. 4. Continuous wave lasers can be made using mixtures of inert gases.

II. *Translate the following sentences with the inversion.*

1. Discussed in this chapter are some of the general characteristics inherent to semiconductors. 2. Included in this section is a description of a typical airborne liquid oxygen system. 3. Shown on the photo is the equipment available at many airports to start piston-engine aircraft. 4.

Described in this book are all the rockets space-probing craft including the sputniks. 5. Associated with each electron is a wave, which is propagated in the direction of the motion of the electron.

III. *Translate the following sentences with the Construction "have+noun+participle".*

1. Machines of many types have their operation controlled by a computer. 2. A colliding molecule may have an atom or two knocked out of it. 3. The theory of atomic structure developed by Bohr has the electrons distributed around the nucleus in shells (orbits). 4. The large air-cooled engines have the cylinders arranged radially. 5. An atom which has one or more of its electrons raised to a higher than normal energy level is said to be in an excited state. 6. Current transformers are step-up transformers having their primaries connected in series with one line and their secondary connected to the ammeter terminals.

IV. *Translate the additional text into Russian in written form.*

AUTOMATION STARTS WITH MEN

Automation is the result of months and years of planning by engineers (using computers, by the way). Automation begins with a team of highly skilled men, automation experts, programmers. They consult with the people who run a factory about the type of operation desired. They prepare a master plan. After the green light is given on the master plan, there are months of detail planning. A medium or large computer is brought in to help solve some of the complicated problems. One of its tasks will be to keep track of production scheduling and inventory control. When you have hundreds of machines working on thousands of items every day, it becomes impossible for human clerks to keep things under control. In the first place, you would have to have too many clerks. In the second place, even with enough clerks, they could not possibly get together and integrate — combine — their information fast enough to do any good. What is needed is a controller robot. It can receive masses of information in a short time and come up with new requirements — parts, machines, raw materials, men.

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