



Министерство образования Республики Беларусь

**Учреждение образования
«Гомельский государственный технический
университет имени П. О. Сухого»**

**Институт повышения квалификации
и переподготовки кадров**

Кафедра «Профессиональная подготовка»

О. В. Литвинко

**ПИСЬМЕННЫЙ ПЕРЕВОД
(АНГЛИЙСКИЙ ЯЗЫК)**

ПОСОБИЕ

**для слушателей специальности 1-21 06 74
«Современный иностранный язык (английский)»
вечерней формы обучения**

Гомель 2015

УДК 811.111'25(075.8)
ББК 81.2-8я73
Л64

*Рекомендовано кафедрой «Профессиональная переподготовка»
ИПК и ПК ГГТУ им. П. О. Сухого
(протокол № 9 от 23.05.2014 г.)*

Рецензенты: зав. каф. иностранных языков Белорусского торгово-экономического университета
потребительской кооперации *Т. А. Дубовцова*

Литвинко, О. В.

Л64 Письменный перевод (английский язык) : пособие для слушателей специальности 1-21 06 74 «Современный иностранный язык (английский)» вечерней формы обучения / О. В. Литвинко. – Гомель : ГГТУ им. П. О. Сухого, 2015. – 166 с. – Систем. требования: PC не ниже Intel Celeron 300 МГц ; 32 Mb RAM ; свободное место на HDD 16 Mb ; Windows 98 и выше ; Adobe Acrobat Reader. – Режим доступа: <https://elib.gstu.by>. – Загл. с титул. экрана.

Пособие подготовлено в соответствии с требованиями, предъявляемыми к дипломированным специалистам, предусмотренным государственным образовательным стандартом по программе подготовки специалиста с дополнительной квалификацией «Переводчик-референт» в сфере профессиональной деятельности.

Для слушателей специальности 1-21 06 74 «Современный иностранный язык (английский)» вечерней формы обучения ИПК и ПК.

УДК 811.111'25(075.8)
ББК 81.2-8я73

© Учреждение образования «Гомельский
государственный технический университет
имени П. О. Сухого», 2015

ПРЕДИСЛОВИЕ

Билингвистическое исследование языка и стиля английской и русской специальной литературы дает возможность получать сопоставительные данные, которые затем ложатся в основу правил перевода как с английского языка на русский язык, так и с русского языка на английский. Для того чтобы овладеть переводом по узкой специальности, достаточно знать закономерности, присущие языку и стилю научной и технической литературы и иметь определенный набор терминов. При этом условии существует возможность быстро приобрести хорошие навыки перевода, независимо от степени владения другими аспектами языка. Поскольку языку и стилю научной и технической литературы присущ формально-логический стиль (формальное, логическое, почти математически точное изложение материала), то, начиная с первых уроков, преподаватель должен обучать студентов этому стилю, прививать им логический, строгий анализ языковых явлений и закономерностей, а также делать упор на те явления, которые являются специфическими для научных и технических текстов и являются причиной стандартных ошибок при переводе.

При введении и закреплении лексического материала необходимо приучать студентов, учитывая полисемию английского языка, видеть различные значения терминов, слов и словосочетаний, характерных для языка научной и технической литературы.

При обработке грамматического материала надо приучать студентов анализировать такие характерные для английского языка грамматические формы, как инфинитивные обороты, причастные, герундиальные обороты, инфинитив с модальными глаголами, условные предложения, указывающие на малую реальность и нереальность условия, и прочие.

При переводе текстов по специальности большинство ошибок обусловлено неправильным восприятием омонимичных грамматических форм. Поэтому при прохождении учебного материала необходимо проводить систематический анализ грамматических форм в разных контекстах, обращая особое внимание на омонимичные формы. При изучении лексики надо концентрировать усилия на тех словах, которые вследствие своей многозначности, при неправильной аналогии с другими словами, словами одного с ними корня или ошибочного графического

восприятия, часто переводятся неправильно и приводят к искажению мысли оригинала. Кроме того, следует обратить особое внимание на функциональные слова и словосочетания, которые обеспечивают логическую связь и уточняют мысль в пределах одного предложения, а также вводные слова, обеспечивающие логическую связь между отдельными предложениями и целыми абзацами.

Поскольку упражнения, приводимые после каждого урока, охватывают одну тему, то основное внимание при прохождении учебного материала следует сосредоточить на тексте урока, в котором всегда присутствует много контекстуальных трудностей. Для этого текст надо переводить, делая фонетический, лексический и грамматический разбор каждого предложения. Если систематически анализировать все предложения текста, то можно быть уверенным в том, что такая работа обеспечит появление навыков сознательного подхода к языковому материалу и подготовит почву для распознавания потенциальных трудностей чтения и перевода научной и технической литературы. После изучения учебного материала и перехода к чтению и переводу оригинальных специальных текстов рекомендуется обращать основное внимание не на расшифровку значений узких терминов, а на освоение общих закономерностей языка и стиля специальной литературы, произношения, словарного запаса и грамматического строя. Необходимо и дальше работать над умением сознательно подходить к тексту, над совершенствованием привычки разбираться во всех его формах, оборотах и конструкциях. Следует помнить, что «вольный перевод» основан или на глубоком знании или на глубоком не знании: приблизительное улавливание общего смысла прочитанного, интуитивная догадка не должны иметь места.

Одним из эффективных средств научиться переводить литературу по специальности является перевод литературы по смежной или незнакомой области, где поневоле студенту приходится прибегать к лексическому и грамматическому анализу. Основная задача студента, изучающего перевод специальной литературы, это уметь различать трудности перевода в любом контексте, поэтому сознательный лексико-грамматический анализ гарантирует правильный перевод смысла текста и передачу авторской мысли.

РАЗДЕЛ 1. ПЕРЕВОД С АНГЛИЙСКОГО НА РУССКИЙ ЯЗЫК

ГЛАВА 1. СТРУКТУРА АНГЛИЙСКОГО ПРЕДЛОЖЕНИЯ. ВИДЫ ПРИДАТОЧНОГО ПОДЧИНЕНИЯ

1. В английском языке простое повествовательное распространенное предложение имеет определенный, устойчивый порядок слов (strict order): подлежащее, сказуемое, прямое дополнение, косвенное дополнение, обстоятельство. Все члены предложения выражаются определенными частями речи, которые раскрывают определенное смысловое значение и являются значимыми элементами предложения. Кроме этого, существуют служебные части речи, которые раскрывают связи слов в предложении - предлоги, союзы, артикли. Служебные части речи также являются формальными признаками границы между членами предложения. Некоторые знаменательные части речи, такие как вспомогательные и модальные глаголы, личные, указательные, притяжательные, неопределенные местоимения, тоже могут служить границей между членами предложения. Ввиду четкого оформления сказуемого (вспомогательный или модальный глагол, или грамматическое окончание) анализ предложения рекомендуется начинать со сказуемого, перед которым обычно стоит подлежащее.

Пример: We have just learned the main advantages of a diesel engine.

Перевод: Мы только что изучили основные преимущества дизельного двигателя.

Пример: That non-stop flight report was published in the previous article.

Перевод: Сообщение об этом беспосадочном полете было опубликовано в предыдущей статье.

2. В синтаксическом отношении структура сложного предложения совпадает как в русском языке, так и в английском. Сложные предложения делятся на сложносочиненные (Complex sentences) и сложноподчиненные предложения (Compound sentences).

Сложносочиненные предложения состоят из двух или более простых предложений, которые соединяются сочинительными союзами *but* и *and*. В смысловом отношении обе части сложносочиненного предложения являются независимыми друг от друга и анализируются также как и простые предложения.

Пример: The burning of fuel is a chemical process and this process changes the fuel into heat, light, gases and ashes.

Перевод: Сжигание топлива является химическим процессом, и этот процесс преобразует топливо в тепло, свет, газы и пепел.

Пример: The wave always travels in a direction at right angles to the wave front but its motion depends upon the relative direction of the lines of electromagnetic and electrostatic flux.

Перевод: Волна всегда распространяется в направлении под прямым углом к фронту волны, но ее движение зависит от относительного направления линий электромагнитного и электростатического потоков.

Сложноподчиненные предложения состоят из главного предложения, которое сохраняет значение самостоятельного утверждения, и придаточного предложения, которое поясняет или дополняет смысл главного предложения. Придаточные предложения присоединяются к главному при помощи подчинительных союзов и союзных слов, имеющих различное подчинительное значение. Отсюда и возникают разные виды подчинительной связи: придаточное дополнительное, придаточное определительное, придаточное обстоятельственное (времени и места, образа действия, причины, условия, уступки). Поэтому синтаксический анализ сложноподчиненного предложения рекомендуется начинать с выделения союза или союзного слова, как указателя придаточного предложения, и установить вид подчинительной связи. При переводе с английского языка следует учитывать многозначность английских союзов, помня о том, что один и тот же союз или союзное слово может вводить разные виды придаточных предложений. Таким образом, вид придаточного предложения определяется по его месту в предложении и по вопросу, на который оно отвечает. Существуют сложноподчиненные предложения с последовательным подчинением.

Перевод на русский язык таких предложений не вызывает трудностей, если придерживаться основных правил анализа.

Пример: The burning of fuel is a chemical process, since it changes the fuel into heat, light, gas and ashes.

Перевод: Сгорание топлива является химическим процессом, так как он преобразует топливо в тепло, свет, газы и золу.

Пример: We know that this method of heat transfer is simply called conduction.

Перевод: Мы знаем, что такой метод передачи тепла обычно называют проводимостью.

Пример: The resistance of a conductor depends on the material that is used for the conductor.

Перевод: Сопротивление проводника зависит от материала, который используется для этого проводника.

Для английских сложноподчиненных предложений характерно так называемое бессоюзное подчинение, то есть отсутствие союза или союзного слова между главным предложением и придаточным. Такое бессоюзное подчинение встречается в придаточных дополнительных и определительных предложениях. Для их правильного перевода следует уметь определять синтаксические функции таких придаточных предложений, то есть определять их место по отношению к членам главного предложения. При переводе на русский язык такие предложения вводятся союзом «что» (придаточные дополнительные) и союзными местоимениями «который, которая» (придаточные определительные).

Пример: The mass of a body is defined as the quantity of matter it contains. (после существительного matter - вопрос «какой?»))

Перевод: Масса тела определяется как количество материи, которое оно содержит.

Пример: We know the temperature of the sun is exceedingly high. (после глагола know - вопрос «что?»))

Перевод: Мы знаем, что температура солнца исключительно высокая.

Следующий вид придаточного подчинения – придаточное подлежащее, структура, отсутствующая в русском языке. Придаточное подлежащее начинается с союзов *that* (что), *what* (что, какой), *how* (как), *whether* (ли) и обычно стоит в начале предложения. На русский язык будет переводиться следующим образом:

Пример: That the driver could not control his car was obvious.

Перевод: То, что водитель не справился с управлением, было очевидно.

Пример: That the engine stopped running surprised everybody.

Перевод: То, что двигатель перестал работать, удивило всех.

Еще один вид придаточного подчинения, начинающийся с союза *that*, называется придаточное сказуемое. Оно представляет именную часть сказуемого с глаголом-связкой *to be* и относится к основному смысловому существительному. Перевод таких придаточных подчинительных виден на следующем примере:

Пример: The most useful property of the diode is that it passes current only in one direction.

Перевод: Самое полезное свойство диода заключается в том, что он пропускает ток только в одном направлении. (или состоит в том, что)

3. В английском языке имеются различные виды эмфатического выделения:

а) готовые конструкции-предложения, переводимые на русский язык строго по образцу, причем, союз *that* в них на русский язык никогда не переводится.

Пример: It was not until the Industrial Revolution that metals became employed in really vast quantities.

Перевод: Лишь только после промышленной революции металлы стали применяться в действительно большом количестве.

Пример: It is this process of fission that made possible the nuclear reactor and the atomic bomb.

Перевод: Именно процесс деления сделал возможным появление ядерного реактора и атомной бомбы.

б) использование вспомогательного глагола *to do* перед смысловым глаголом – сказуемым, и который будет переводиться усилительными словами «действительно, в самом деле».

Пример: Analytic geometry does apply algebraic principles and methods to the treatment of geometric problems.

Перевод: Аналитическая геометрия действительно применяет алгебраические принципы и методы для решения геометрических задач.

в) инверсия, как эмоционально-логическое выделение той или иной части предложения с изменением порядка слов в предложении.

Пример: Never before had a rocket reached the Moon.

Перевод: Никогда прежде ракеты не долетали до луны!

г) в английском языке существует такой стилистический прием - литота, то есть по форме отрицательное, а по смыслу утвердительное высказывание. Следует отметить двойной характер литоты: оговорка придает ей эмфатическую окраску, которая и создается необычной структурой высказывания. При переводе литота передается антонимическим сочетанием слов, и оговорка компенсируется лексически.

Пример: It is not an uncommon occurrence

Перевод: Это весьма обычный случай.

Пример: It is not intolerable, you know, to see a colleague, perhaps a rival, made a fool of.

Перевод: Знаете, довольно-таки приятно увидеть, как коллега, возможно, соперник, одурачился.

4. Необходимо остановиться на переводе неопределенно-личных и безличных предложений, характерных для английского языка.

а) в неопределенно-личных предложениях подлежащее выражается неопределенно-личными местоимениями *one, any one,*

every one, поэтому они будут переводиться на русский язык безличными предложениями.

Пример: One should distinguish between the electromotive force and potential difference.

Перевод: Следует различать электродвижущую силу и разность потенциала.

б) в безличных предложениях всегда имеется подлежащее, выраженное местоимением It. Оно никогда не будет переводиться на русский язык, так как не имеет смыслового значения и только выполняет функцию формального подлежащего. Такие предложения тоже переводятся на русский язык безличными предложениями.

Пример: It is interesting to note that in January, 1946 the group of American scientists received the first radar reflection from the Moon.

Перевод: Интересно отметить, что в январе 1946 года группа американских ученых впервые получила радиолокационное отражение от Луны.

УПРАЖНЕНИЕ 1. Сделайте синтаксический анализ предложений и переведите их на русский язык.

1. These plots offer a test of ideal gas behavior.
2. Further experiments are devised to test the validity of the hypothesis in as many ways as possible.
3. There is also, of course, an element of luck involved in scientific discoveries.
4. The data for chemical investigations most often come from large-scale phenomena and observations.
5. Substances differ from one another in composition and can be identified by their appearance, smell, taste, and other properties.
6. A chemical reaction involves only the separation, combination, or rearrangement of atoms; it does not result in their creation or destruction.
7. Radiation is the term used to describe the emission and transmission of energy through space in the form of waves.
8. Two allotropic forms of the element carbon- diamond and graphite- present dramatic differences not only in properties but also in their relative cost.

9. In most cases, ionic compounds contain a metallic element as the cation and a nonmetallic element as the anion.

10. Oxidation- reduction reactions are very much a part of the world around us; they range from combustion of fossil fuels to the action of household bleaching agents.

11. One type of gravimetric analysis experiment involves the formation, isolation, and mass determination of a precipitate.

12. In practice, chemists often deal with substances of unknown or only partially defined composition.

13. In Chapter 4 we used relationships between amounts (in moles) and masses (in grams) of reactants and products to solve stoichiometry problems.

14. In other words, the absolute temperature is an index of the random motion of the molecules- the higher the temperature, the more energetic the motion.

15. Earth, unlike, say, Jupiter, does not have appreciable amounts of gases such as hydrogen or helium in its atmosphere; a smaller planet, Earth has a weaker gravitational attraction for these lighter molecules.

16. Because the average speed of helium is considerably greater than that of molecular nitrogen or molecular oxygen, more helium atoms escape from Earth's atmosphere into outer space.

17. The dull red glow of an electric heater and the bright white light of a tungsten light bulb are examples of radiation from solids heated to different temperatures.

18. Thus, the more intense the light, the greater the number of electrons emitted by the target metal; the higher the frequency of the light, the greater the kinetic energy of the emitted electrons.

19. Einstein's work paved the way for the solution of yet another nineteenth- century "mystery" in physics: the emission spectra of atoms.

20. Molecular geometry refers to the three- dimensional arrangement of atoms in a molecule.

21. How can we predict whether or not a reaction will take place?

22. Raising the temperature does accelerate the reaction, but at the same time it promotes the decomposition of molecules.

23. Is there a thermodynamic quantity that can help us predict whether a process will occur spontaneously?

24. This chapter discusses the fundamental principles and applications of electrochemical cells, the thermodynamics of

electrochemical reactions, and the cause and prevention of corrosion by electrochemical means.

25. Heat engines play an essential role in our technological society; they range from automobile engines to the giant steam turbines that run generators to produce electricity.

26. The gas laws are important generalizations regarding the macroscopic behavior of gaseous substances.

27. The properties of steel depend not only on its chemical composition but also on the heat treatment.

28. Molecular hydrogen forms a number of hydrides with transitional metals; in some of these compounds, the ratio of hydrogen atoms to metal atoms is not constant.

29. The problem is not unique to the United States; any region with a high density of industrial installations also has precipitation with a pH of 4 or lower.

30. Electrolysis has many important applications in industry, mainly in the extraction and purification of metals.

УПРАЖНЕНИЕ 2. Определите виды придаточных предложений и переведите их на русский язык.

1. The word «system» here means that part of the universe that is under investigation.

2. Words that we use in everyday life often take on a new meaning in a scientific context.

3. Many ionic compounds are soluble in water, and the resulting aqueous solutions conduct electricity, because the compounds are strong electrolytes.

4. Because fusion reactions take place only at very high temperatures, they are often called thermonuclear reactions.

5. However, since sodium chloride is harmful to plant life and promotes corrosion of cars, its use for this purpose is of considerable environmental concern.

6. As we move from left to right across a period, there is a transition from metals to metalloids to nonmetals.

7. The extent to which a weak acid ionizes depends on the initial concentration of the acid.

8. So far we have considered salts in which only one ion undergoes hydrolysis.

9. When solids are heated, they emit radiation over a wide range of wavelengths.

10. The bell or other alarm signal operates only when the circuit is broken.

11. Coke is the residue left after certain soft coals have been heated in the absence of air.

12. When iron is cast into a metal mould the surface is chilled very rapidly.

13. As the vibration dies down, the intensity of the sound diminishes.

14. If a ringing bell is touched with the fingers, the sound ceases because the vibrations are stopped by the fingers.

15. If we want to get a lot of power out of particular engine, we run fast as it can go safely.

16. Part of U-235 becomes changed into the various fission products when a reactor has been working for a while.

17. Fast neutrons can penetrate any material and must be slowed before they can be absorbed.

18. As the warm air rises, cooler air takes its place.

19. Every wire carrying an electric current has a magnetic field so long as the current flows.

20. When the energy of the sun reaches the earth it causes the molecules of the body on which it falls to vibrate more rapidly and the body is heated.

УПРАЖНЕНИЕ 3. Выделите придаточное подлежащее в следующих сложных предложениях и переведите их на русский язык.

1. No knowledge of how the atoms are linked together in the compound is required.

2. What has been said about pure solids also applies to liquids.

3. Much of what we have said so far about acids applies to bases.

4. How a pure metal is obtained by reduction from its combined form depends on the standard reduction potential of the metal.

5. What you should understand is that the stability of any nucleus is determined by the difference between coulombic repulsion and this attraction.

6. That any gas can be turned into a liquid by pressure is known to everyone.

7. Whether it is necessary to apply an enormous pressure to a liquid to get changes in volume is not difficult to prove.

8. In practice it does not matter whether the conductors cut the magnetic flux or the magnetic flux cuts the conductors, the action is the same.

9. That heat flows from a place of higher to one of lower temperature but never in the reverse direction should be kept in mind.

10. What has been called the scientific method began to appear in the time of Galilei.

11. That we use countless machines today needs no proof.

12. That the liquid state is the normal state for water is a well-known fact.

13. How heat is transferred by convection can be illustrated by a stove.

14. What we see is not steam at all but fine water particles.

15. That an increased pressure will tend to prevent this expansion and, thus, to prevent the conversion of water into steam is obvious.

УПРАЖНЕНИЕ 4. Выделите придаточное сказуемое в следующих сложных предложениях и переведите их на русский язык.

1. An important guideline for writing the correct formulas of ionic compounds is that each compound must be electrically neutral.

2. Another serious possibility is that an air embolism might develop.

3. One interesting aspect of metabolism is that the overall change in energy is the same as it is in combustion.

4. The important difference between metabolism and combustion, however, is that the latter is usually a one- step, high- temperature process.

5. The significance of Maxwell's theory is that it provides a mathematical description of the general behavior of light.

6. One benefit of knowing the periodic trends in physical properties is that we can use this knowledge to predict properties of elements.

7. The most striking property of water is that its solid form is less dense than its liquid form: an ice cube floats at the surface of water in a glass.

8. The implication of the collision theory is that a reaction always occurs when an A and a B molecule collide. However, not all collisions lead to reactions.

9. One of the main advantages of solid- state devices over vacuum tube electronics is that the former can be made on a single «chip» of silicon no larger than the cross section of a pencil eraser.

10. The reason it takes less energy for the first step is that the electron- electron repulsion, or electron shielding, results in a reduction of the attraction of the nucleus for each electron.

11. Sulfuric acid is the perennial number-one-ranked industrial chemical. The reason is that it is used in the manufacture of fertilizers, polymers, drugs, paints, detergents, and paper, and in petroleum refining, metallurgy, and other numerous processes.

12. A notable absence among the top 50 industrial chemicals produced in the United States is hydrogen; the reason is that hydrogen is often used captively, that is, it is used at the site where it is prepared.

13. An important characteristic of radiation is that it can occur in a vacuum.

14. The principle of operation is that a heated liquid produces vapour and that the vapour expands and exerts pressure.

15. The important point to remember is that the blower on a two-cycle engine is simply an air pump.

16. The question is whether the temperature of the air is high enough to ignite the particles of the injected fuel.

17. The question is what a diesel engine is, how it works and how it differs from a gasoline engine.

18. Ohm' law is that the current flowing in a circuit varies directly as the electro-motive force and inversely as the resistance of the circuit.

19. The next question is how such ions interact with microwave radiation.

20. The first stage in the long journey of the sound is that the microphone transforms the music or speech it hears into electrical currents.

УПРАЖНЕНИЕ 5. Выделите придаточное дополнительное в следующих сложных предложениях, учитывая союзное и бессоюзное подчинение. Переведите предложения на русский язык.

1. Later experiments showed that the rays actually consisted of electrically neutral particles having a mass slightly greater than that of protons.

2. Note that this water displacement method for collecting a gas is based on the assumptions that the gas does not react with water and that it is not appreciably soluble in it.

3. In 1832 the Scottish chemist Thomas Graham found that under the same conditions of temperature and pressure, rates of diffusion for gaseous substances are inversely proportional to the square roots of their masses.

4. We see that in some places there are parallel trends between atomic radii and ionic radii; for example, from top to bottom of the periodic table both the atomic radius and the ionic radius increase.

5. Suppose we want to predict the boiling point of an element.

6. Yet we know that these gases easily and spontaneously mix in any proportion, which means that the process is highly favorable.

7. Note that both precipitation and crystallization describe the separation of excess solid substance from a supersaturated solution.

8. The fact that electrons flow from one electrode to the other indicates that Fossil fuels are a major source of energy, but conversion of fossil fuel into electrical energy is a highly inefficient process.

9. Qualitatively, these plots show the potential energy changes as reactants are converted to products.

10. Do you know how a four-cycle diesel engine works?

11. Now let's trace what happens in a typical two-cycle diesel engine.

12. A simple experiment with a glass of water and a postcard will show you how real this pressure is.

13. When heating gases, we find they act in exactly the same way as liquids.

14. Do you know the English unit of power is called?

15. Experiments show us that there is very little attraction between the molecules of any gas.

16. We know the specific heat of a substance is defined as the amount of heat required to raise the unit weight of a substance through 1° of temperature.

17. We have already seen how the addition of an extra particle increases the binding energy of a nucleus.

18. He wanted to see if these substances also gave rise to X-rays.

19. Everyday observation shows us that the effect moving air produces on a body depends on the velocity of the air or the velocity of the body.

20. Suppose a turn of wire is placed on the rotor of a generator and each end of the turn is attached to one of two very small metallic sectors on an insulated ring.

УПРАЖНЕНИЕ 6. Выделите придаточное определительное в следующих сложных предложениях, учитывая союзное и бессоюзное подчинение. Переведите предложения на русский язык.

1. Gravimetric analysis is an analytical procedure that involves the measurement of mass.

2. A barometer is an instrument that measures atmospheric pressure.

3. However, a series of investigations that began in the 1850-s and extended into the 20-th century clearly demonstrated that atoms actually possess an internal structure; that is, they are made up of even smaller particles, which are called subatomic particles.

4. Table 2.1 summarizes the mass and charge of the three subatomic particles that are important in chemistry- the electron, the proton, and the neutron.

5. The two types of chemical formulas we need to become familiar with are molecular formulas and empirical formulas.

6. The amount of limiting reagent present at the start of a reaction is related to the quantity of product we can obtain from the reaction.

7. These reactions are examples of quantitative analysis, which is concerned with the determination of the amount or concentration of a substance in a sample.

8. The characteristic that is of interest to us here is the spread, or distribution, of molecular speeds.

9. The equation, which incorporates the assumptions we have mentioned, is based on a statistical analysis of the behavior of the molecules.

10. Whereas diffusion is a process by which one gas gradually mixes with another, effusion is the process by which a gas under pressure escapes from one compartment of a container to another by passing through a small opening.

11. In practice, the rate of effusion of a gas is inversely proportional to the time it takes for the gas to effuse through a barrier- the longer the time, the slower the effusion rate.

12. To understand Planck's quantum theory, we must first know something about the nature of radiation, which is the emission and transmission through space of energy in the form of waves.

13. Figure 7.4 shows various types of electromagnetic radiation, which differ from one another in wavelength and frequency.

14. A fourth quantum number that describes the behavior of a specific electron- the spin quantum number- completes the description of electrons in atom.

15. The only way physicists could explain these results was to assume that electrons act like tiny magnets.

16. The density of an element depends on three quantities: the atomic mass, the size of the atoms, and the way in which the atoms are packed together in the condensed state.

17. This is consistent with the fact that metals are good conductors of heat and electricity, whereas nonmetals are poor conductors in both respects.

18. Water is so common a substance on Earth that we often overlook its unique nature.

19. The process is similar to perspiration, which is one of the effective means by which the human body maintains a constant temperature.

20. One is the energy factor, which here determines whether a solution process is exothermic or endothermic.

21. To chemists the dynamic equilibrium that takes the form of a chemical reaction is of particular interest. This kind of equilibrium is called chemical equilibrium.

22. An engine is a machine that converts energy to work; a heat engine is a machine that converts thermal energy to work.

23. By definition, the electrode at which oxidation occurs is called the anode; the electrode at which reduction occurs is the cathode.

24. To generate electricity, heat produced by the reaction is first used to convert water to steam, which then drives a turbine that drives a generator.

25. In case we are considering the average current remains unchanged.

УПРАЖНЕНИЕ 7. Выделите придаточное обстоятельственное в следующих предложениях. Переведите предложения на русский язык.

1. Yet when we look at the composition of seawater, we find that the concentration ratio of sodium to potassium is about 28 to 1.

2. Although all halogens are highly reactive and toxic, the magnitude of reactivity and toxicity generally decreases from fluorine to iodine.

3. A substance appears colored because it absorbs light at one or more wavelengths in the visible part of the electromagnetic spectrum and reflects or transmits the others.

4. This field, if brought near to the magnetic compass, will cause a deviation of many degrees while current is flowing.

5. When the condenser is used on alternating currents the frequency of the current will determine the amount of energy that can be passed.

6. A moving train or automobile loses its kinetic energy when the brakes are applied but an examination of the brakes and wheels show that energy has been converted into heat.

7. One of the reasons why people before the eighteenth century knew hardly anything about gases was that they were difficult to handle.

8. In the preceding chapter it was shown how the concepts of work and energy had been developed from Newton's of motion.

9. The energy that passes through unit area decreases as the square of the radii increases.

10. When an alternating current flows through a circuit that has inductance, the induced electromotive force and the current do not move along evenly together but the induced electromotive force lags behind the current and this is called phase lag.

11. Flames tubes are mounted concentrically within the chambers and combustion is completed before the gas enters the turbine.

12. Since the plane is horizontal and frictionless the only forces of interest are those which either body exerts on the other during the time the two are in contact.

13. Everyone who has taken snapshots knows that the lens focuses the light so that a picture is formed on the film.

14. It is a highly important instrument as it serves to indicate to the pilot whether his engine is operating efficiently.

15. Another remarkable fact is that the instruments not only show the operator how things are at the moment but warn him of impending disturbances.

16. The fundamental principle all a.c. generators depend on is that an e.m.f. is induced when a conductor is made to cut across a magnetic flux.

17. When the body has come to rest the amount of work that has been done will be just equal to the work done in starting the body.

18. The fact that the earth receives great quantities of heat from the sun shows that this heat can pass through the empty space between the sun and the atmosphere that surrounds the earth.

19. Any two sheets of metal which are insulated from and are adjacent to one another form a condenser.

20. The degree of penetration of X-rays depends upon wavelength, for X-rays are produced over a large waveband, and upon the atomic weight of the material they are entering.

21. As it is generally known, gas consists of matter which molecules are in such a state of agitation that gas is always trying to expand.

22. A mechanism is attached to the diaphragm in such a way that the indicating hand is moved as the diaphragm expands or contracts.

23. The undercarriage, flaps and air brakes are operated by an engine-driven hydraulic pump and there is a hand pump which can be used for all services in an emergency.

24. In practice, the other vibrations we use for this purpose can be equally well applied to the transmission of any variation in an electric current.

25. A lamp voltmeter is one of the most useful measuring instruments the radio engineer can possess.

УПРАЖНЕНИЕ 8. Определите виды придаточного подчинения (союзного или бессоюзного) и переведите их на русский язык.

1. The reactions we have considered so far are all relatively simple.

2. Consider the synthesis of polyethylene, which is used in many items in everyday life such as piping, bottles, electrical insulation, toys, and mailer envelopes.

3. Silicon dioxide is insoluble and does not react with water; it has acidic properties because it reacts with very concentrated bases.

4. As we have seen, the formula of a compound tells us the composition of the compound.

5. The process in which dissolved solute comes out of solution and forms crystals is called crystallization.

6. When molecules collide, part of their kinetic energy is converted to vibrational energy.

7. Vegetable oils have considerable nutritional value, but some oils must be hydrogenated before we can use them because of their unsavory flavor and their inappropriate molecular structures.

8. Such behaviour is consistent with the fact that electrons possess a negative charge.

9. The last row of elements belongs to the actinide series, which starts at thorium; most of these elements are not found in nature but have been synthesized.

10. Properties of steel depend also on heat treatment the metal is subjected to.

11. We have seen a number of cases where one type of energy has been transformed into another.

12. The emission from X-ray tube of the kind we have described consists largely of continuous radiation.

13. The liquid whose viscosity is to be measured is poured into the annular space between the cylinders.

14. This is the principle the mercury thermometer is based upon.

15. There is evidence that the Egyptians possessed formulas for the solution of simple geometrical problems as early as, say, 2500-2000 B.C.

16. The molecules of the medium in which the sound travels move back and forth in the direction of the propagation of the sound.

17. Pythagoras discovered the theorem concerning the right-angle triangle which is known to this day as the theorem of Pythagoras.

18. This part of mechanics, which includes both the study of motion and the forces that bring about the motion, is called dynamics.

19. A diesel engine is that type of internal combustion engine which injects fuel in a finely divided state into cylinder within which air has been compressed to a high pressure and temperature.

20. After the machine starts it is behaving as a generator to some extent and the voltage it generates tends to reduce the current.

21. This condition demands that the material the structure is composed of must be used with maximum efficiency.

22. The ratio of useful work done by an engine to the heating value of fuel it consumes is called thermal efficiency of the engine.

УПРАЖНЕНИЕ 9. Переведите на русский язык следующие эмфатические предложения. Укажите тип эмфатического выделения.

1. However, it was not until 1808 that an English scientist and school teacher, John Dalton, formulated a precise definition of the indivisible building blocks of matter that we call atoms.

2. But he did realize that the different properties shown by elements such as hydrogen and oxygen, for example, can be explained by assuming that hydrogen atoms are not the same as oxygen atoms.

3. Shortly after de Broglie advanced his equation, Thomson in England demonstrated that electrons do indeed possess wavelike properties.

4. According to the electromagnetic theory, a spinning charge generates a magnetic field, and it is this motion that causes the electron to behave like a magnet.

5. Although the existence of molecules was hypothesized as early as the 17th century, it was not until early in this century that chemists understood how and why molecules form.

6. Metals such as copper and aluminum are good conductors of electricity; they do possess some electrical resistance.

7. It is the increase in disorder of the system that favors the solubility of any substance.

8. Until about the late 1940-s the main source of benzene was coal.

9. Thus, we will concentrate only on his important assumptions and final results, which do account for the positions of the spectra lines.

10. But this is not the way the original periodic table was constructed in the nineteenth century.

11. Of all the intricate processes that have evolved in living systems, none is more striking or more essential than enzyme catalysis.

12. Raising the temperature does accelerate the reaction, but at the same time it promotes the decomposition of molecules.

13. It was on June 2, 1875 that the first sounds were transmitted by Bell and Watson.

14. It is this energy that is defined as the ability to do work.

15. Analytic geometry does apply algebraic principles and methods to the treatment of geometric problems.

16. It is this chain reaction that is responsible for the function of both the atomic bomb and the atomic pile.

17. It was only after some progress had been made in the use and development of the electric current that men began to realize the importance and possibilities of magnets.

18. Even if the pointer did swing at that speed the indications would not be readable.

19. It is our great Lomonosov who first discovered the Law of Conservation of Energy.

20. It is only by performing a large number of experiments and building up data, much of which appear later as irrelevant, that progress can be made.

УПРАЖНЕНИЕ 10. Переведите на русский язык следующие безличные и неопределенно-личные предложения.

1. It was known that hydrogen, the simplest atom, contains only one proton, and that the helium atom contains two protons.

2. It is an interesting chemical phenomenon that certain elements can exist in more than one stable form.

3. At this point, it is useful to distinguish between a «gas» and a «vapor», two terms that are often used interchangeably but do not have exactly the same meaning.

4. It follows that the volume of any given gas must be proportional to the number of molecules present.

5. It is of great practical importance to know the value of K since it tells us the relative quantities of the reactants and products formed at equilibrium, and hence the yield of the reaction.

6. It turns out that the property of dual nature (particles and waves) is not unique to light but is characteristic of all matter, including submicroscopic particles like electrons.

7. However, it turns out that the Schrodinger equation cannot be solved exactly for any atom containing more than one electron!

8. It is believed that there is a solid core made up mostly of iron and nickel at the center of Earth.

9. Because the halogens are very reactive elements, it is not surprising that they all also form binary compounds among themselves.

10. One must also know how large a cable or strut is needed to withstand this force and how much the structure will distort under the load.

11. For the acceleration of heavy projectiles such as protons and α -particles it is convenient to use a constant magnetic field.

12. It is important to collect in the multiplier as much as possible of the light emitted from the phosphor.

13. It requires almost no power to operate the grid as there is normally no current flowing in the grid circuit.

14. To study the effect of conductors and insulators one might try the following simple experiment.

15. One should clearly understand that the direction and magnitude of the electric forces are represented by the lines of force.

16. It is frequently necessary to find the components of a force in other than horizontal and vertical directions.

17. It has been assumed in the preceding discussion that all of the forces lie in the same plane.

18. It was pointed out that while the lead obtained from the disintegration of radium possessed all the characteristics of ordinary lead, it differed from it in atomic weight.

19. One should not think that the very amount of heat which will raise the temperature of one gram of water from 0° to 1°C will also raise the temperature of the same mass of water from, say, 60° to 61°C .

20. It is interesting to note that in January 1946 a group of scientists received a radar reflection from the Moon.

УПРАЖНЕНИЕ 11. Сводное (контрольное). Переведите предложения на русский язык, указывая вид подчинительной связи.

1. For this reason, random molecular motion is sometimes referred to as thermal motion, because it is related to the temperature of the gas sample.

2. Gases exert pressure on any surface with which they come into contact, because the gas molecules are constantly in motion and collide with the surface.

3. Ever since the 17th century, when Newton showed that sunlight is composed of various color components which can be recombined to produce white light, chemists and physicists have studied the characteristics of emission spectra of various substances, that is, either continuous or line spectra of radiation emitted by the substances.

4. They thought of an atom as an entity in which electrons whirled around the nucleus in circular orbits at high velocities.

5. In the hydrogen atom, it was believed that the electrostatic attraction between the positive “solar” proton and the negative “planetary” electron pulls the electron inward and that this force is balanced exactly by the acceleration due to the circular motion of the electron.

6. The world of chemical substances and reactions involves systems considerably more complex than simple atomic species like hydrogen.

7. We have seen that the value of an average rate depends on the time interval we choose.

8. It is this process of fission that made possible the nuclear reactor and the atomic bomb.

9. The equipment we use today in our coal mining industry guarantees complete safety.

10. If the bushes have been moved to such a position that the coils they connect cut the lines of force, the galvanometer will indicate the flow of current.

11. It is assumed that when a message is broadcast, the body of the message is preceded by the address of the receiving location for which the message is intended.

12. The retarding force which stops an automobile when its brakes are applied is the friction force between the tires and the road, and the larger the coefficient of friction, the greater the available force is.

13. In order to study more carefully the law applying to conduction of heat, consider the case in which heat flows along a uniform bar which ends are kept at uniform temperature so that the fall of temperature in the bar remains always the same.

14. Since every wave passing the receiving antenna induces its own voltage in the conductor, it is necessary that the receiving equipment should be capable of separating the desired signal from the unwanted signals that are also inducing voltages in the antenna.

ГЛАВА 2. ПЕРЕВОД ВРЕМЕННЫХ КОНСТРУКЦИЙ В ДЕЙСТВИТЕЛЬНОМ И СТРАДАТЕЛЬНОМ ЗАЛОГЕ

Глагол в английском языке имеет личные и неличные формы. Личные формы глагола согласуются с подлежащим в лице и числе и являются сказуемым в предложении. Личные формы глагола выражают время, залог и наклонение.

В систему английских глагольных времен входят 4 группы: Simple Tenses, Continuous Tenses, Perfect Tenses, Perfect Continuous Tenses.

Времена группы Simple указывают на факт совершения действия, на повторность и регулярность действия, на обычный характер действия в настоящем, прошлом и будущем.

Времена группы Continuous указывают на процесс совершения действия, происходящего в данный момент в настоящем, прошедшем и будущем, или на действие постоянного характера, происходящее непрерывно в течение какого-то периода времени.

Времена группы Perfect указывают на законченность, совершенность действия к определенному моменту речи в настоящем, прошедшем и будущем. Все времена этой группы переводятся на русский язык совершенным видом (что сделал).

Времена группы Perfect Continuous указывают на то, что действие началось, продолжается в течение какого-то периода времени в настоящем или прошлом и может продолжаться в данный момент, не имея результата действия.

Каждая группа времен имеет формы для выражения настоящего, прошедшего и будущего времени. Значение и употребление времен глагола в страдательном залоге такое же, как и времен глагола в действительном залоге, но формы образования различны.

Сводная таблица всех временных форм глагола в действительном залоге

	Present	Past	Future
SIMPLE TENSES	1) I, we, you, they work. 2) He, she, it works. Do I work? Does he work? I do not (don't) work. He does not (doesn't) work.	1) I, you, we, he, she, it, they worked (для прав.гл-ов). 2) I, you, we, he, she, it, they thought (для неправ.гл-ов). Did he work? Did I think? He did not (didn't) work. I did not think.	1) I, we shall work 2) You, he, she, it, they will work. Shall we work? Will he work? We shall not (shan't) work. He will not (won't) work.
CONTINUOUS TENSES	1) I am working. 2) You, we, they are working. 3) He, she, it is working. Is he working? Are they working? He is not (isn't) working. They are not (aren't) working.	1) I, he, she, it was working. 2) You, we, they were working. Was he working? Were they working? He was not (wasn't) working. They were not (weren't) working.	1) I, we shall be working. 2) He, she, it, you, they will be working. Shall I be working? Will he be working? I shall not (shan't) be working. They will not (won't) be working.
PERFECT TENSES	1) I, we you, they have thought. 2) He, she, it has worked. Has he worked? Have they thought? He has not (hasn't) worked. They have not (haven't) thought.	I, you, we, he, she, it, they had worked. Had they worked? They had not (hadn't) worked.	1) I, we shall have worked. 2) He, she, it, they will have thought. Shall we have worked? They will not have worked.

PERFECT CONTINUOUS TENSES	1) I, we, you, they have been working. 2) He, she, it has been working. Have you been working? I shan't have been working.	1) I, you, we, he, she, it, they had been working. Had he been working? He had not been working.	1) I, we shall have been working. 2) He, she, it, you, they will have been working. Shall we have been working? They won't have been working.
------------------------------	---	--	--

Все времена в страдательном залоге образуются с помощью вспомогательного глагола to be в соответствующем лице, числе и времени и смыслового глагола в форме причастия прошедшего времени Participle II.

Сводная таблица всех временных форм глагола в страдательном залоге.

	Present	Past	Future
SIMPLE PASSIVE	1) I am asked. 2) He, she, it is asked. 3) You, we, they are asked. Am I asked? Is he asked? Are they asked? I am not asked. He is not asked. They are not asked.	1) I, he, she, it was asked. 2) We, you, they were asked. Was he asked? Were you asked? He was not asked. They were not asked.	1) I, we shall be asked. 2) You, we, he, she, it, they will be asked. Shall we be asked? Will he be asked? He will not be asked. WE shall not be asked.

CONTINUOUS PASSIVE	1) I am being asked. 2) He, she, it is being asked. 3) You, we, they are being asked. Is he being asked? Are you being asked? He is not being asked. You are not being asked.	1) I, he, she, it was being asked. 2) You, we, they were being asked. Was he being asked? Were they being asked? He was not being asked. They were not being asked.	
PERFECT PASSIVE	1) I, you, we, they have been asked. 2) He, she, it has been asked. Has he been asked? Have you been asked? He hasn't been asked. I haven't been asked.	1) I, you, we, he, she, it, they had been asked. Had he been asked? Had they been asked? He hadn't been asked. They hadn't been asked.	1) I, we shall have been asked. 2) You, we, he she, it, they will have been asked. Will you have been asked? Shall we have been asked? I shall not have been asked. They will not have been asked.

Варианты перевода конструкций страдательного залога на русский язык.

Когда сказуемое выражено глаголом в страдательном залоге, он указывает на то, что действие совершается над лицом или предметом, то есть лицо или предмет находятся в пассивном положении и сами действий не совершают.

На русский язык глагол в страдательном залоге чаще всего может переводиться:

а) с применением антонимического перевода, то есть, конструкция в страдательном залоге трансформируется в конструкцию в действительном залоге на русском языке.

Например: The energy is dissipated in the iron in the form of heat.

Перевод: Энергия рассеивается в железе в форме тепла.

Например: Your luggage will be looked after by somebody.

Перевод: Кто-нибудь присмотрит за вашим багажом.

б) сочетанием форм глагола «быть» с краткой формой причастия.

Например: Heat was transformed into work.

Перевод: Тепло было преобразовано в работу.

в) перевод подлежащего английского предложения косвенным дополнением на русский язык или глаголом в 3-ем лице в неопределенно-личном предложении.

Например: The engineer was asked to test the device.

Перевод: Инженера попросили испытать устройство.

Например: A new device for measuring pressure is being designed now.

Перевод: Сейчас конструируют новый прибор для измерения давления.

Например: He was told to bring the tools.

Перевод: Ему сказали принести инструменты.

г) сказуемое с отделяемым предлогом, который управляет действиями подлежащего и относится к нему, при этом конструкция такого типа переводится неопределенно-личным предложением на русский язык.

Например: Your invention was spoken of at the last meeting.

Перевод: О вашем изобретении говорили на прошлом собрании.

Например: He was sent for as he was the only one to help us.

Перевод: За ним послали, так как он был единственным, кто мог нам помочь.

УПРАЖНЕНИЕ 1. Определите время и залог сказуемого в следующих предложениях и переведите их на русский язык.

1. As oxygen gas is generated, the gas bubbles rise to the top and water is pushed out of the bottle.

2. The combustion of hydrogen gas in oxygen is one of many familiar chemical reactions that release considerable quantities of energy.

3. Any process that gives off heat (that is, transfers thermal energy to the surroundings) is called an exothermic process.

4. The solution process, like all physical and chemical processes, is governed by two factors.

5. You will be faced with learning the names of the compounds you encounter.

6. Over the years chemists have devised clear, systematic ways of naming chemical substances.

7. Various organizations have stepped up efforts to educate the public about the dangers of intoxication on America's roads, and stiffer penalties have been imposed for such offenders.

8. The gas laws we will study in this chapter can be regarded as useful summaries of the results of countless experiments on the physical properties of gases that were carried out over several centuries.

9. Since the discovery of laser in 1960, it has been used in numerous systems designed to operate in the gas, liquid, and solid states.

10. Lasers have played an important role in the spectroscopic investigation of molecular properties and of many chemical and biological processes.

11. They are called the principal quantum number, the angular momentum quantum number, and the magnetic quantum number.

12. Consequently, the elements also display periodic variations in their physical and chemical behavior.

13. They have extensive three-dimensional structures in which each cation is surrounded by a specific number of anions, and vice versa.

14. Since nylon fibers were first synthesized in the 1930-s, many synthetic fibers have been reported; Kevlar is one of the newer classes of synthetic fibers.

15. Kevlar is heat-resistant and seven times as strong as steel per unit weight. It is used in belts for automobile tires, ropes, aircraft construction, and lightweight, bullet proof vests.

16. Intra-molecular forces are responsible for the stability of individual molecules, whereas intermolecular forces are primarily responsible for the bulk properties of matter.

17. Now that you are familiar with intermolecular forces, we can look at the properties of substances in condensed states, which are largely determined by those forces.

18. In this section we will look at two phenomena associated with liquids: surface tension and viscosity.

19. The structures and properties of crystals are determined by the kinds of forces that hold the particles together.

20. At a given temperature, when the maximum amount of a substance has dissolved in a solvent, we have a saturated solution.

21. Suppose, as a prominent industrial chemist at the turn of the century, you are asked to design an efficient procedure for synthesizing ammonia from hydrogen and nitrogen.

22. The world's fossil fuel reserve is being depleted at an alarmingly fast rate.

23. The structure and properties of noble gas compounds have been thoroughly investigated by many physical and chemical techniques.

УПРАЖНЕНИЕ 2. Переведите следующие предложения в страдательном залоге на русский язык.

1. Many of the names were derived from their physical appearance, properties, origin, or application; for example, milk of magnesia, laughing gas, limestone, caustic soda, lye, washing soda, and baking soda.

2. Physicists had always assumed that energy is continuous, which meant that any amount of energy could be released in a radiation process.

3. Below the threshold frequency no electrons were ejected no matter how intense the light.

4. Although it was immediately recognized that this procedure is useful, the origin of these lines was unknown until early in this century.

5. Recall that energy is always required to break chemical bonds and that chemical bond formation is always accompanied by a release of energy.

6. As the atoms approach each other, each electron is attracted by the nucleus in the other atom, and at the same time, the electrons repel each other, as do the nuclei.

7. That explanation was based on the understanding that a gaseous system is a collection of molecules in constant, random motion.

8. Molecules in the liquid are held by one or more types of attractive forces, which will be discussed in the next section.

9. Many solids are characterized by a long-range order; that is, the molecules are arranged in regular configurations in three dimensions.

10. Chemical equilibrium represents a balance between forward and reverse reactions; in most cases, this balance is quite delicate.

11. About 75% of hydrogen is produced by the steam-reforming process; in this process, a mixture of methane and water are reacted at high temperatures to form carbon monoxide and hydrogen.

12. The increasing concentration of acidic oxides in the atmosphere has posed a serious environmental problem in recent years- acid rain.

13. In a galvanic cell, chemical energy is converted into electrical energy; electrical energy in this case is the product of the e.m.f. of the cell and the total electrical charge that passes through the cell.

14. The common dry cell, that is, a cell without fluid component, is used in flashlights and transistor radios.

15. The mercury battery is used extensively in medicine and electronic industry and is more expensive than the common dry cell.

16. Hydrogen is the only element which isotopes are given different names; hydrogen has three isotopes: hydrogen, deuterium (symbol D), and tritium (symbol T).

17. Tritium is a radioactive isotope with a half-life of about 12.5 years; deuterium oxide, or heavy water as it is commonly called, is used in some nuclear reactors as a coolant and a moderator of nuclear reactions.

18. Large quantities of chlorine are used to produce insecticides; however, in view of the damage they inflict on the environment, the use of many of these compounds is either totally banned or greatly restricted in the United States.

19. Various designs have been developed for particles accelerators, one of which accelerates particles along a linear path of about 3 km (2 miles).

20. Natural gas is often associated with petroleum, with which it has a common origin in the decomposition of organic matter in sedimentary deposits.

21. Many vegetable products are used in the chemical industry, for example, natural oils such as castor oil, palm oil, and olive oil are used in the manufacture of soap and margarine.

22. Argon is used mainly in electric light bulbs to provide an inert atmosphere; because of its inert nature, argon is also employed to flush dissolved oxygen gas from molten metals in metallurgical processes.

23. Nuclei can also undergo change as a result of bombardment by neutrons, electrons, or other nuclei; nuclear changes that are induced in this way are known as nuclear transmutation.

УПРАЖНЕНИЕ 3. Переведите следующие предложения, выделив отделяемый предлог.

1. The body may be acted on by any number of external forces having arbitrary directions and applied at arbitrary points of the body.

2. This engine is usually referred to as an internal combustion engine because fuel is burned within its cylinders or combustion chambers.

3. An interesting case involving parallel forces occurs when a body is acted on by two forces which are equal in magnitude but opposite in direction and whose lines of action do not coincide.

4. The resistance of a given conductor depends on the material it is made of.

5. A battery or other source supplies a potential difference for the circuit it is connected to.

6. The performance of a given tube depends upon the efficiency free electrons are produced with.

7. Whatever the nature of the tube and the arrangement of electrodes be, an emitting electrode is not dispensed with.

8. The vertical and horizontal lobes on a kite balloon are sometimes referred to as stabilizers.

9. These molecules are acted on both by forces of cohesion exerted on them by other molecules of the liquid and by forces of adhesion exerted by the molecules of the walls.

10. This transmission of heat by the motion of the fluid against a solid is referred to as convection transfer.

11. The material which is referred to in the engineer's report is difficult to find.

12. The force referred to is an elastic restoring force brought into play whenever a body is distorted from its normal shape.

13. Many materials now commonly used were not even thought of thirty years ago.

УПРАЖНЕНИЕ 4. Переведите следующие предложения на русский язык, используя допустимые варианты перевода.

1. The subject of elasticity will be discussed more fully in chapter B.
2. The current transformer also insulates the instrument from the circuit which is being measured.
3. If some current flows through a thin wire and then that same amount of current is sent through a thicker one, a different amount of heat will be developed in both these wires.
4. We shall consider next how friction force which has been neglected up to this point affects the mechanical energy of a moving body.
5. In many instances, however, it is necessary to consider the rate at which work is done as well as the total amount of work accomplished.
6. The changes that will have taken place are best represented by a graph as in Fig. 20 which illustrates the following facts.
7. It will, thus, be seen that the motor action and the dynamo action, which for the sake of convenience are studied separately, cannot, as a matter of fact, have separate existence.
8. It has already been pointed out that, by making the antenna circuit resonant to a particular frequency, the energy abstracted from radio waves of that frequency will be much greater than the energy from waves of other frequencies.
9. After the current has been flowing for some time, a film of oxide forms on the aluminium plate.
10. In Class A amplifiers the plate current flows at all times, even though no signal is being amplified.
- 11 The voltage change is brought about by the difference in the number of turns in the two coils.
12. When the rays enter the lens, they are bent towards the normal and when the rays leave the lens, they are bent away from the normal.
13. Radioactive isotopes are also being used successfully for food conservation, for the prevention of sprouting in potatoes and so on.
14. Accurate tests have shown that, if an instantaneous flash of light such as a spark discharge is thrown on a photoelectric cell, the emission of electrons takes place within three billionths of a second.
15. The material has been arranged in such a manner that, if each description is studied in order and the reason for each adjustment is understood, a good grasp of the practical application of material which has been given in the previous chapter will be secured.

16. No harmful influence of the work of the atomic power station on the health of the workers has been observed.

17. Solar energy converters equipped with large mirrors have already been used in our country.

18. Certain corrections that are needed with both the air-speed indicator and the altimeter are given by a computer, which has been specially designed to allow for certain physical changes in the atmosphere.

19. The danger of a whirling propeller is universally recognized and regulations have been carefully prepared to minimize this hazard.

20. In one type of air-speed indicator there is a difference of pressure between two sides of the diaphragm which I caused to move and this movement is transferred to an indicator dial on a clock face which is calibrated so as to read in miles per hour.

21. Atmospheric pressure, which is due to the weight of the air, is measured by the height of a column of mercury.

22. When a body or structure is subjected to external loads, internal forces are created by the corresponding elastic deformation of the body or structure which oppose the external forces and thereby maintain equilibrium.

23. Electrical circuits were dealt with in Chapter I and this chapter will be confined principally to magnetic circuits.

24. Another subject in Radio Astronomy concerns the reception of radio waves which are being generated by some processes in outer space.

25. The magnetron is a vacuum tube which current is influenced by a magnetic field.

УПРАЖНЕНИЕ 5. Сводное (контрольное). Переведите следующие предложения на русский язык, определяя форму времени и залога.

1. The solution of the Schrodinger equation shows that the energies an electron can possess in the hydrogen atom are given by the same expression as that obtained by Bohr.

2. Although in principle an electron can be found anywhere, we know that most of the time it is quite close to the nucleus.

3. Equally important was the fact that it made possible the prediction of the properties of several elements that had not yet been discovered.

4. In studying the periodic trends, bear in mind that the atomic radius is determined to a large extent by how strongly the outer- shell electrons are held by the nucleus.

5. For elements in the second period of the periodic table, eight is the maximum number of electrons that an atom of any of these elements can accommodate; this is the reason that the octet rule is usually obeyed by the second- period elements.

6. So far we have used the hydrogen molecule to illustrate molecular orbital formation, but the concept is equally applicable to other molecules.

7. In mercury, cohesion is greater than the adhesion between mercury and glass, so that a depression in the liquid level actually occurs when a capillary tube is dipped into mercury.

8. Hydrogenation reduces the number of double bonds in the molecule but does not completely eliminate them; if all the double bonds are eliminated, the oil becomes hard and brittle.

9. Furthermore, vast areas of the ocean floor are covered with manganese nodules, which are made up mostly of manganese, along with iron, nickel, copper, and cobalt.

10. In the preliminary treatment of an ore, the desired mineral is separated from waste materials- usually clay and silicate minerals- which are collectively called the gangue.

11. The carbon monoxide that is released is recycled back into the process.

12. Over long periods of time (on geological scale), silicate minerals are slowly decomposed by wind and rain, and their sodium and potassium ions are converted to more soluble compounds.

13. Because lead is relatively impenetrable to high- energy radiation, it is also used in protective shields for nuclear chemists, X- ray operators, and radiologists.

14. Coal is a natural dark brown to black solid used as a fuel; it is formed from fossilized plants and consists of amorphous carbon with various organic and some inorganic compounds.

15. The fibrous silicate mineral known as asbestos has been used for thousands years; the term is a commercial one that refers to several fibrous inorganic materials that are used in industry for their mechanical strength and resistance to heat.

ГЛАВА 3. ПЕРЕВОД ПРИЧАСТИЙ И ПРИЧАСТНЫХ ОБОРОТОВ

Формы причастий (Participle I и Participle II)

Причастие (Particle)	Действительный залог	Страдательный залог
Simple Participle	creating, broken	being created
Perfect Participle	having created	having been created

Функции причастий в предложении и способы их перевода.

1.Определение		
<p>а) одиночное определение перед существительным (какой, какая, какое?) переводится на русский язык причастиями совершенного и несовершенного вида</p>	<p>a <u>running</u> engine, a <u>broken</u> circuit, an <u>expanding</u> gas, a <u>charged</u> body</p>	<p><u>работающий</u> двигатель, <u>разомкнутая</u> цепь, <u>расширяющийся</u> газ, <u>заряженное</u> тело</p>
<p>б) определительный оборот после существительного переводится на русский язык придаточным определительным предложением или причастным определительным оборотом</p>	<p>Gases are composed of a number of molecular particles <u>moving at tremendous speed</u>. The gas is in a discharge tube <u>containing two electrodes</u></p>	<p>Газы состоят из множества молекулярных частиц, <u>движущихся с огромной скоростью</u>. Газ находится в газоразрядной лампе, <u>которая содержит два электрода</u>.</p>
<p>2.Обстоятельство а) обстоятельственные причастные обороты, <u>отделяемые запятой в начале предложений</u>, переводятся на русский язык деепричастием,</p>	<p><u>Flowing from inlet to exhaust valve</u>, the steam expands greatly. <u>Having been heated</u>, the substance changed its</p>	<p><u>Проходя от впускного клапана до выхлопного</u>, пар сильно расширяется. <u>Когда вещество нагрето</u>, оно меняет свои свойства.</p>

<p>деепричастным оборотом, или полным придаточным обстоятельством предложением б) обстоятельственные причастные обороты после союзов while, when, if, as</p>	<p>properties. <u>If distilled</u>, the water will become quite tasteless. <u>As seen from the table</u>, the atomic weight refers to this substance. <u>While melting</u>, this snow keeps the same temperature.</p>	<p><u>Если воду перегнать</u>, он станет совершенно безвкусной. <u>Как видно из этой таблицы</u>, атомный вес относится к этому веществу. <u>Тая</u>, снег сохраняет одну и ту же температуру.</p>
<p>3. Абсолютный или независимый причастный оборот (Absolute Participial Construction) <u>всегда отделяется запятой или запятыми</u> в зависимости от места в предложении. Оборот не имеет союзных слов, что затрудняет его перевод. При переводе абсолютного оборота следует по контексту определить обстоятельственное значение оборота и восстановить необходимый союз: времени (когда), условия (если), причины (так как) или сопутствующих обстоятельств (причем). Далее причастная форма преобразуется в глагольное сказуемое, которое согласуется в</p>	<p><u>The engineer testing the motor</u>, the committee came to see the work of the motor. <u>The temperature of melting ice rising</u>, the motion of its molecules is speeded up. <u>The compressibility of the gasoline being known</u>, the compressibility of the gas could be calculated. <u>The experiment having been carried out</u>, we decided to have a rest.</p>	<p><u>Когда инженер проводил испытания двигателя</u>, пришла комиссия чтобы наблюдать за работой двигателя. <u>Когда температура тающего льда повышается</u>, движение его молекул ускоряется. <u>Так как сжимаемость бензина была известна</u>, можно было вычислить сжимаемость газа. <u>Когда опыт был проведен</u>, мы решили отдохнуть.</p>

<p>лице и числе с существительным оборота, а время сказуемого согласуется со временем в главной части предложения.</p>		
<p>4. Атрибутивные причастия, описывающие эмоции или состояние, могут употребляться как часть именного сказуемого после глагола-связки to be. При переводе на русский язык следует четко видеть разницу в значении и не путать причастия с формами времен Continuous.</p>	<p>The answer of the engineer was <u>disappointing</u>. The trip to the mountains was <u>exciting</u>.</p>	<p>Ответ инженера был <u>разочаровывающий</u>. Поездка в горы была <u>волнующей</u>.</p>
<p>5. Причастие образует устойчивые вводные обороты, отделяемые запятой в начале предложения.</p>	<p>Generally speaking, strictly speaking, mildly speaking, frankly speaking, roughly speaking, saying nothing of, judging by (appearance)</p>	<p>В общем говоря, строго говоря, мягко говоря, честно говоря, грубо (примерно) говоря, не говоря ничего о, судя по (наружности).</p>
<p>6. Каузативный причастный оборот с Participle II после глаголов to have или to get. Он означает, что действие совершает не само лицо, а кто-то другой за него или для него.</p>	<p>I <u>have had</u> my watch <u>mended</u>. He <u>had</u> his chest <u>X-rayed</u> last week. She <u>will have</u> her hair <u>cut</u> next Monday.</p>	<p>Мне <u>починили</u> часы. Он <u>сделал рентген</u> на прошлой неделе. Она <u>сделает стрижку</u> в следующий понедельник.</p>

УПРАЖНЕНИЕ 1. Определите форму и функцию причастия в следующих предложениях и переведите их на русский язык.

1. All atoms of a given element are identical, having the same size, mass, and chemical properties.

2. Referring to the two examples above, the system may be a group of college students or a mixture of hydrogen and air.

3. Electromagnetic theory tells us that a moving charged body behaves like a magnet and can interact with electric and magnetic fields through which it passes.

4. Depending on the deflection, these two rays are called alpha (α) rays and beta (β) rays.

5. Consequently, much of the energy released is lost to the surroundings.

6. A wave can be thought of as a vibrating disturbance by which energy is transmitted.

7. The idea was so revolutionary that Planck himself was not entirely convinced of its validity- he spent years looking for alternative ways to explain the experimental findings.

8. The gas under study is in a discharge tube containing two electrodes.

9. Each component color is focused at a definite position, according to its wavelength, and forms a colored image of the slit on the photographic plate.

10. Depending on the mode of operation, the laser light may be emitted in pulses (as in the ruby laser case) or it may be emitted in continuous waves.

11. In 1926 Erwin Schrodinger, using a complicated mathematical technique, formulated the sought- after equation.

12. Elements that require particular care are those belonging to the transition metals, the lanthanides, and the actinides.

13. In practice, we normally think of atomic size as the volume containing about 90% of the total electron density around the nucleus.

14. Utilizing these concepts, we can survey the chemical behavior of the elements systematically, paying particular attention to the relationship between chemical properties and electron configuration.

15. The expression “slow as molasses in January” owes its truth to another physical property of liquids called viscosity.

16. Glass is one of civilization's most valuable and versatile materials; it is also one of the oldest- glass articles dated back as far as 1000 B.C.

17. Given enough time, the transfer will continue to completion.

18. Under this condition the change in the amount of formic acid present in solution has no effect on the rate measured.

19. Energetically speaking, there is some minimum collision energy below which no reaction occurs.

20. Lacking this energy, the molecules remain intact, and no change results from the collision.

21. The mathematical treatment of enzyme kinetics is quite complex, even when we know the basic steps involved in the reaction.

22. Using several buffer systems, nature has provided an extremely efficient method for the delivery of oxygen and the removal of carbon dioxide.

23. A battery is an electrochemical cell, or often several electrochemical cells connected in series, that can be used as a source of direct electric current at a constant voltage.

24. In addition, fuel cell generators are free of the noise, vibration, heat transfer, thermal pollution, and other problems normally associated with conventional power plants.

25. Corrosion is the term usually applied to the deterioration of metals by an electrochemical processes; we see many examples of corrosion around us- iron rust, silver tarnish, the green patina formed on copper and brass; corrosion causes enormous damage to buildings, bridges, ships, and cars.

УПРАЖНЕНИЕ 2. Определите форму и функцию причастия в предложениях и переведите их на русский язык.

1. Having discussed chemical formulas of molecules and compounds, we will now consider two important laws that played a major role in the early steps toward understanding chemical compounds.

2. Having discussed the general properties of aqueous solutions, we are now ready to study some common and important reactions in this medium in this and the next two sections.

3. Having discussed the concept of oxidation number, we are now ready to look at several types of redox reactions.

4. Having classified the elements according to their electron configurations, we can now look at the way chemists represent metals, metalloids, and nonmetals that appear in chemical equations as free elements.

5. Having defined reaction order, we can now better appreciate the dependence of rate on reactant concentrations as follows.

6. Having discussed the strengths of acids and bases, we now look at some typical acid- base reactions in aqueous solution.

7. Having made a great number of experiments with various substances, the chemists found that most of them could be decomposed into other substances.

8. Having been tested in action, the carburetor was greatly modified to give a regular supply of the mixture to the cylinder.

9. The gas turbine having been tested at our plant functions quite properly now.

10. Having defined two units of power, the horsepower and the kilowatt, we may use these units to define two new units of work, the horsepower-hour and the kilowatt-hour.

УПРАЖНЕНИЕ 3. Определите функцию слов, имеющих окончание -ed, и переведите предложения на русский язык.

1. Negatively charged particles, or electrons, emitted from the cathode are drawn to a positively charged plate, the anode.

2. Planck's work, however, showed that energy can be released only in certain definite amounts, called quanta.

3. Figure 8.11 shows the radii of ions derived from the more familiar elements, arranged according to their positions in the periodic table.

4. In each case, the atom to which the proton becomes attached possesses at least one unshared pair of electrons.

5. As defined earlier, a salt is an ionic compound formed by the reaction between an acid and a base.

6. Because phosphates are plant nutrients, waste waters containing phosphates discharged into aquatic life eventually succumbs.

7. With the exception of hydrogen, all nuclei contain two kinds of fundamental particles, called protons and neutrons; some nuclei are unstable: they emit particles and/ or electromagnetic radiation spontaneously.

8. The extremely energetic particles produced in accelerators are employed by physicists to smash atomic nuclei to fragments.

9. The cost of preparing deuterium is minimal compared with the value of the energy released by the reaction.

10. The pressure exerted by a gas results from the impact of its molecules on the walls of the container (Boyle's law).

11. Experiments had already demonstrated that electrons were ejected from the surface of certain metals exposed to light of at least a certain minimum frequency, called threshold frequency.

12. It was Lenz who proved that the heat produced in a given time is proportional to the square of the current.

13. The power expended on a circuit is measured by the product of the amperes generated in it and the potential difference in volts at the ends of that circuit.

14. Static, steady or dead loads are forces that are applied slowly and not repeated and remain constant when applied to the body.

15. Generators are usually removed and serviced in the manner explained before.

16. An ammeter or a voltmeter connected in the circuit, you can directly read off the amperes of the former and the volt of the latter.

17. The gas mixture produced by the carburetor is of no value unless it is ignited and gas ignited quickly produces more force if first compressed.

18. This process is carried out until the small cylinder is brought up to its proper pressure as determined by a gauge.

19. The voltage induced in a winding located in a magnetic field was investigated experimentally by Faraday.

20. When poles of two fixed magnets are placed together, the magnets may move apart, when released, but the energy represented is a return of part of the energy originally required to bring them together.

21. The work of an air-speed indicator is based on the difference between the pressure exerted by moving air and the pressure which is at standstill.

22. When reading a map, an airman must be able to interpret the map from the landsman's point of view; he must understand the conventional signs that are the special knowledge of the seaman; and he must recognize those things as they appear to him when seen from the aircraft travelling at high speed through great range of altitude.

23. The charged particles gradually pick up speed, revolving in a closed curve along the circular vacuum chamber in the magnetic field of a giant electromagnet.

24. The forces of wing ribs applied to the spar are concentrated.

25. If the network has several voltage sources, each branch current is composed of several component currents, each component produced by one of the individual voltage sources.

УПРАЖНЕНИЕ 4. Выделите причастные обороты в функции обстоятельства и переведите предложения на русский язык.

1. Metals tend to form cations in compounds; on the other hand, nonmetallic elements form anions when combined with metals.

2. Many substances other than hydrogen (helium, neon, sodium, and mercury, for example) give off visible light when excited in an electric discharge tube.

3. One of the most important questions we ask when studying the properties of atomic orbitals is- What are the shapes of the orbitals?

4. Thus lithium, while exhibiting many of the properties characteristic of the alkali metals, differs in some ways from the rest of the metals.

5. Most oxides can be classified as acidic or basic depending on whether they produce acids or bases when dissolved in water or react as acids or bases in certain reactions.

6. Actually it has been known for over 70 years that certain metals and alloys, when cooled to very low temperatures, lose their resistance totally.

7. Ice on frozen roads and sidewalks melts when sprinkled with salts.

8. Once released into the atmosphere, freons slowly diffuse up to the stratosphere, where UV radiation of wavelengths between 175 nm and 220 nm causes them to decompose.

9. These are all symptoms of hypoxia, a deficiency in the amount of oxygen reaching body tissues; in serious cases, the victim may slip into a coma, and die if not treated quickly.

10. When carrying out solubility and/or solubility product calculations, keep the following important points in mind.

11. Sometimes it is desirable to remove one type of ion from solution by precipitation while leaving other ions in solution.

12. Beryllium is highly toxic, especially if inhaled as a dust; it is also used as a moderator for neutrons produced in nuclear reactions.
13. When exposed to ozone, the metal becomes dull looking and sticks to glass tubing (instead of flowing freely through it).
14. All electrical conductors dissipate heat when carrying current.
15. While working with the map, make sure that you know whether your map is marked in feet or in meters.
16. It should be borne in mind, when working on transmitters, that very dangerous voltages will exist.
17. When first exhibited at the exposition, the telephone attracted very little attention and was even ridiculed.
18. When pulled to one side of its equilibrium position and released, the pendulum bob vibrates about this position with motion which is both periodic and oscillatory.
19. A piece of ice will melt if thrown into the water.
20. A body at rest remains at rest unless acted upon by an external force.
21. If heated, magnetized steel will lose its magnetism because heating makes the molecules move around rapidly and expands the metal.
22. A gasoline engine can drive an automobile or a tractor only when supplied constantly with heat from the exploding gasoline in the cylinder.
23. When describing standard telephones, we say that additional microphone positions can, of course, be arranged if required.
24. When subjected to alternating magnetization, the loop is traversed once for every cycle of the current and so the energy wasted per second is proportional to the frequency.
25. Relays, if improperly designed or cared for, may give far more trouble than any other part of the electrical and radio circuits.

УПРАЖНЕНИЕ 5. Выделите в следующих предложениях независимый причастный оборот и переведите их на русский язык.

1. The hardest natural substance known, diamond is used in industry as an abrasive and to cut concrete and other hard substances.
2. A second- order reaction is a reaction which rate depends on reactant concentration raised to the second power or on the concentrations of two different reactants, each raised to the first power.

3. DNA molecules are among the largest molecules known; they have molar masses of up to tens of billions of grams. On the other hand, RNA molecules vary greatly in size, some having a molar mass of about 25,000g.

4. It has been estimated that an average living cell may contain some 3000 different enzymes, each of them catalyzing a specific reaction in which substrates are converted into the appropriate products.

5. Though Polzunov's engine has been tested in operation and showed good results, it was disassembled and soon forgotten, its inventor having died in poverty.

6. There being no other traffic, the driver can maintain a constant speed of, say, 60 km/hr.

7. Part of the energy being changed into heat, not all the chemical energy of the cell battery is transformed into electric energy.

8. 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.

9. 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.

10. The positive pole having been brought near the negative pole, the latter attracts it.

11. Two bodies having potentials of 100 volts and 50 volts, a potential difference exists between them of 50 volts.

12. The current distribution over the cross section of the conductor being non-uniform, the resistance increases.

13. 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.

14. Two bodies being placed in contact with each other, the temperature of the hot body falls, while that of the cold one rises.

15. Class A insulation is the most common in industrial equipment, class B and class C being used rather seldom.

16. Operating characteristics of high-vacuum tubes are usually given in graphical form, the plate –characteristic curves being the most common.

17. The great majority of transformers are built with iron cores, the outstanding exception being air-core transformers for use at high frequencies.

18. The motor being designed according to the scheme discussed above, the speed of rotation of the armature is proportional to the rate at which energy passes through the meter to the consumer.

19. The two windings generally have a widely different number of turns, the ratio of turns being directly proportional to the ratio of the no-load voltages.

20. As we know, mechanical energy is transformed into heat, the process being one example of the conservation of energy.

21. The forces exerted against the liquid by the walls are shown by arrows, the forces being everywhere perpendicular to the walls of the vessel.

22. Liquids and gases differ markedly in their compressibilities, a gas being easily compressed, while a liquid is practically incompressible.

23. In engineering work in Britain and everyday life as well the term "density" is used for the weight per unit volume, the common unit being the pound per cubic foot.

24. A vacuum bottle is constructed with double glass walls, the space between the walls being evacuated, so that heat flow by conduction and convection is practically eliminated.

25. Very small transformers are cooled by the atmosphere, no special cooling arrangements being necessary.

УПРАЖНЕНИЕ 6. Сводное (контрольное). Определите форму и функцию причастий и переведите предложения на русский язык.

1. Strictly speaking, an orbital does not have a well-defined shape because the wave function characterizing the orbital extends from the nucleus to infinity.

2. Contained in a stainless steel cylinder, the mercury battery consists of a zinc anode (amalgamated with mercury) in contact with a strongly alkaline electrolyte containing zinc oxide and mercury 2 oxide.

3. Today semiconductors are essential components of nearly all electronic equipment, ranging from radio and television sets to pocket calculators and computer facilities.

4. Faced with this dilemma, scientists have made intensive efforts in recent years to develop a method of obtaining hydrogen gas as an alternative energy source.

5. Radon is formed as a product in the uranium-238 decay series; being an alpha particle emitter, radon produces radioactive polonium, which in turn decays to other radioactive isotopes.

6. Starting with the original radioactive nucleus, the sequence of disintegration steps is called a decay series.

7. Compared with the fission process, nuclear fusion looks like a very promising energy source, at least “on paper”.

8. Compared with proteins, which are made of up to different amino acids, the composition of nucleic acids is considerably simpler.

9. Natural gas is a mixture of gaseous hydrocarbons; it occurs in reservoirs of porous rock (sand or sandstone) capped by impervious strata.

10. When exposed to the sun’s ultraviolet rays, these compounds become photo-excited and they can cause the polymers to break down into small units.

11. The first fission reaction studied was that of uranium-235 bombarded with slow neutrons, whose speed is comparable to that of air molecules at room temperature.

12. The distance occupied by one complete cycle of such an alternating wave is equal to the velocity of the wave divided by the number of cycles that are sent out each second and is called the wavelength.

13. The weight of the liquid in the sections lettered A is supported by the vertical components of these forces.

14. When broadly used, the term “alloy” may include mixture of metals and not solid solutions.

15. The degree of success obtained, when estimating the weight of a new design, depends largely on experience combined with data on previous airplanes and the knowledge of the proposed type of construction.

ГЛАВА 4. ПЕРЕВОД ГЕРУНДИАЛЬНЫХ ОБОРОТОВ

Герундий (the Gerund) является неличной формой глагола. Он имеет свойства глагола и существительного и всегда выражает действие как развивающийся процесс. Герундий имеет формы омонимичные формам причастия, поэтому главное отличие герундия в том, что он употребляется после большого количества предлогов. Так как герундий имеет много функций, он может переводиться на русский язык существительным, неопределенной формой глагола, деепричастием или деепричастным оборотом в зависимости от выполняемой функции в предложении.

Герундий (The Gerund)	Действительный залог	Страдательный залог
Simple Gerund	writing	being written
Perfect Gerund	having written	having been written

Функции герундия во многом сходны функциями инфинитива, но оба они обозначают разные действия: герундий обозначает действие как процесс, а инфинитив обозначает действие как результат.

1. Функция подлежащего: герундий может переводиться на русский язык существительным или инфинитивом.	<p><u>Adding</u> heat to a substance does not always cause a rise of temperature.</p> <p>It's no use (good) <u>discussing</u> it now, we must act.</p> <p>It's worth <u>testing</u> this engine.</p> <p>There is no <u>deceiving</u> him, he can read my face like a book.</p>	<p><u>Добавление</u> тепла веществу не всегда вызывает повышение его температуры.</p> <p>Нет смысла <u>обсуждать</u> это сейчас, мы должны действовать.</p> <p>Стоит <u>испытать</u> этот двигатель.</p> <p>Его <u>не обмануть</u>, он читает по моему лицу как по книге.</p>
--	--	---

<p>2.1. Часть именного сказуемого: герундий может переводиться на русский язык существительным или инфинитивом.</p>	<p>My favourite occupation is <u>reading</u>. What he loves most of all is <u>going to the theatre</u>.</p>	<p>Мое любимое занятие - <u>чтение</u>. Что я люблю больше всего - это <u>ходить</u> в театр.</p>
<p>2.2. Часть составного глагольного сказуемого (после глаголов burst out, begin, cease, continue, finish, stop, start, can't help (but)).</p>	<p>The audience burst out <u>applauding</u>. He finished making the experiment. I couldn't help <u>being excited</u> when I was told that news.</p>	<p>Аудитория <u>разразилась аплодисментами</u>. Он закончил <u>проведение</u> эксперимента. Я не мог <u>не разволноваться</u>, когда мне сообщили эту новость.</p>
<p>3.1. Функция прямого дополнения (после глаголов avoid, deny, enjoy, mind, deserve, like, dislike, hate, prefer, can't bear, can't afford, etc.). Герундиальный оборот переводится придаточным дополнительным предложением.</p>	<p>Would you <u>mind having</u> a business talk over the telephone? He <u>denied</u> the message <u>having been sent</u> by post. I <u>can't bear being asked</u> about my private affairs.</p>	<p>Вы <u>не возражаете, чтобы обсудить</u> дела по телефону? Он <u>отрицал, что письмо было отправлено</u> по почте. Я <u>не выношу, когда меня спрашивают</u> о личных делах.</p>

<p>3.2. Функция предложного дополнения (после глаголов approve of, complain of, think of; agree to, object to, rely on, insist on, depend on, succeed in, prevent from, etc.). Переводится придаточным дополнительным предложением.</p> <p>Запомнить! После глаголов want, need, require, deserve, герундий имеет только форму активного залога, несмотря на пассивное значение</p>	<p>We succeeded in <u>repairing</u> these parts ahead of time.</p> <p>He insisted <u>on our repairing</u> the motor at once.</p> <p>He is responsible <u>for repairing</u> these parts.</p> <p>They were prevented <u>from repairing</u> these parts by unforeseen circumstances.</p> <p>My car needs <u>repairing</u>.</p>	<p>Нам удалось (что?) <u>отремонтировать</u> эти части досрочно.</p> <p>Он настаивал (на чем?) на том, <u>чтобы мы отремонтировали</u> мотор сразу.</p> <p>Он отвечает (за что?) <u>за ремонт</u> этих частей.</p> <p>Непредвиденные обстоятельства помешали им (что сделать?) <u>отремонтировать</u> эти части.</p> <p>Моей машине нужен <u>ремонт</u>.</p>
<p>4. Функция определения после существительных с предлогами of, for, in, at. Герундий может переводиться на русский язык существительным или инфинитивом.</p>	<p>He pointed out <u>way of avoiding</u> complications.</p> <p>The transformer is <u>a device for raising or lowering</u> voltage.</p> <p><u>The necessity of repairing</u> these parts is perfectly obvious.</p>	<p>Он указал <u>способ</u> (какой?), <u>как избежать</u> осложнений.</p> <p>Трансформатор - это <u>прибор</u> (какой?) для <u>повышения или понижения</u> напряжения.</p> <p><u>Необходимость</u> (какая?) <u>ремонтировать</u> эти детали совершенно очевидна.</p>

<p>5. Функция обстоятельства после большого количества предлогов (on, upon, after, at, by, in, without, besides, instead of, for, for fear of, owing to, through, because of, in spite of, before). Переводится придаточным предложением по обстоятельству значению предлога, деепричастием или деепричастным оборотом.</p>	<p>He could repair these parts <u>without using</u> a special device. We have been sent here <u>for repairing</u> these parts. <u>On repairing</u> the motor, we started it immediately. <u>In repairing</u> these parts, he developed his great skill. You will learn a great deal <u>by repairing</u> these parts.</p>	<p>Он смог отремонтировать эти части, <u>не применяя</u> специального устройства. Нас прислали сюда, <u>для того, чтобы отремонтировать</u> эти части. <u>Отремонтировав</u> мотор, мы сразу запустили его. <u>Ремонтируя</u> эти части, он проявил большое мастерство. Вы научитесь многому, <u>ремонтируя</u> эти части. (как?- путем ремонта)</p>
<p>6. Терминологический герундий выражает функциональное отношение (для чего?) в отличие от определительной функции причастия, когда стоит перед существительными.</p>	<p><u>Walking</u> stick, <u>washing</u> machine, <u>writing</u> pen, <u>sitting</u> room, <u>drawing</u> room, <u>dancing</u> master, <u>eating</u> apples, <u>cooking</u> apples, <u>running</u> shoes, <u>swimming</u> race, <u>melting</u> point, <u>boiling</u> point, <u>sliding</u> friction, <u>rolling</u> friction.</p>	<p>Трость, <u>стиральная</u> машина, ручка, столовая, гостиная, учитель <u>танцев</u>, яблоки <u>для еды</u>, яблоки <u>для готовки</u>, кроссовки, гонки <u>по плаванию</u>, раздевалка, точка <u>плавления</u>, точка <u>кипения</u>, трение <u>скольжения</u>, трение <u>качения</u>.</p>

УПРАЖНЕНИЕ 1. Выделите герундий в функции подлежащего в следующих предложениях и переведите их на русский язык.

1. Upon heating, a solid will melt to form a liquid; on the other hand, cooling a gas will condense it into a liquid.

2. Feeding the world's rapidly increasing population requires that farmers produce ever-larger and healthier crops.

3. Since the average kinetic energy of gas molecules is proportional to the sample's absolute temperature, raising the temperature increases the average kinetic energy.

4. Arranging elements according to their atomic masses in a periodic table seemed logical to those chemists, who felt that chemical behavior should somehow be related to atomic mass.

5. Therefore, knowing the bond energies and hence the stability of molecules tells us something about the thermo-chemical nature of reactions that molecules undergo.

6. Knowing the radii of the ions is helpful in understanding the structure and stability of these compounds.

7. The following example shows how knowing the nature of reactants and products makes it possible to predict entropy changes.

8. Further heating tends to rupture the chains, and the viscosity begins to decrease.

9. Writing an equation for a nuclear reaction is more involved than writing an equation for an ordinary chemical reaction.

10. Studying the debris from such disintegrations provides valuable information about nuclear structure and binding forces.

11. Roasting of sulfide ores produces sulfur dioxide; in addition, various particulate matters such as soot, ashes which contain heavy metal salts, and dust are also generated by the plant.

12. Pulling a rubber band increases its length.

13. Representing the electric field by means of these lines helps us to picture the forces between the charged bodies.

14. Discussing the term "work" in detail is the subject of our next article, for we know of its being often misused.

15. Acquiring knowledge is not in itself sufficient you must also practice the art of applying this knowledge to problems you meet with.

16. Protecting the personnel against radioactive radiation holds an important place in the scheme of things at the atomic power plant.

17. Firing the gas mixture in the combustion chamber is called ignition.

18. Charging by induction will be discussed in the next Chapter.

УПРАЖНЕНИЕ 2. Выделите герундий в функции сказуемого и переведите на русский язык следующие предложения.

1. In pure form, manganese is a brittle, hard metal that has a silver white appearance; its main use is in making steel.

2. The second effect of increasing the magnet current is increasing the field strength at every point.

3. The most accurate method of determining relative humidity is measuring the temperature of the dew point.

4. The usual method of altering the frequency is including in the oscillator circuit a variable condenser.

5. When a helical spring is stretched the actual distortion of the wire is a combination of stretching, bending and torsion.

6. The main point of a transformer is changing voltage although the power of both sides of the transformer is equal.

7. The main advantage of this instrument over the moving coil type is measuring both alternating current and direct current.

8. The simplest process of producing metal articles is casting the molten metal into a suitable mold.

9. The first step in the measurement of a physical quantity is choosing a unit of that quantity.

10. The effect of this shape of the duct is building up the pressure of the air while decreasing the velocity.

11. Perhaps one of the biggest problems is ventilating ducts. They act as speaking tubes, carrying noise from one area to another.

12. Previously the only way of effecting the reaction in saturated compounds was heating with concentrated sulphuric acid.

УПРАЖНЕНИЕ 3. Выделите герундий в функции дополнения (прямого или косвенного) и переведите следующие предложения на русский язык.

1. In this procedure, the first step involves carefully defining the problem.

2. The next step includes performing experiments, making careful observations, and collecting bits of information about the system.

3. The police often use a device called a breath analyzer to test drivers suspected of being drunk.

4. We must be careful, however, in predicting properties when elements change from nonmetals through metalloids to metals.

5. Valence bond theory is one of the two quantum mechanical approaches that explain bonding in molecules.

6. The shield prevents the strong un-diffracted X-rays from damaging the photographic plate.

7. Intermolecular hydrogen bonding is mainly responsible for maintaining the three-dimensional ice lattice.

8. After that all the vapor has condensed, the temperature of the liquid begins to drop; continued cooling of the liquid finally leads to freezing.

9. We can think of activation energy as a barrier that prevents less energetic molecules from reacting.

10. Because some members of the uranium series have very long half-lives, it is particularly suitable for estimating the age of rocks in Earth and of extraterrestrial objects.

11. Despite the theoretical difficulties Bohr experienced in extending the usefulness of his model of the atom, his fundamental notion of electronic energy levels has been maintained and incorporated in the quantum mechanical concepts we are reviewing here.

12. Radar is used in finding the position of a target with respect to a fixed point on the ground.

13. The chain reaction releases great quantities of γ -radiation and neutrons which must be prevented from escaping into the atmosphere.

14. He remembered once having read that at very low temperatures some metals become super-conducting, having practically zero specific resistance.

15. We know of the electric furnace being an ideal melting and refining unit for the steel industry.

16. We know of the velocity of electromagnetic waves changing when the wave front crosses the boundary between two media.

17. We were informed of a new record of a non-stop flight having been established.

18. That failure was due to the designer's having been somewhat careless, although we must confess the conditions were unfavourable.

19. The engineer insisted on those reservoirs being used for holding aviation gasoline.

20. At the present time radio can be used in orientating the aircraft or in fixing the aircraft position.

21. We know of valve transmitters being divided into two types: self-oscillators and power amplifiers.

22. When considering storage batteries, it is often convenient to use "ampere hours" in calculating the charge and the discharge of a battery.

23. Iron possesses the property of confining the electrical field, preventing it from being dissipated over a large area.

УПРАЖНЕНИЕ 4. Выделите герундий в функции определения и переведите следующие предложения на русский язык.

1. This section will deal with some basic definitions, types of oxidation- reduction reactions, and a method for balancing the equations representing these reactions.

2. It accounts, at least qualitatively, for the stability of the covalent bond in terms of overlapping atomic orbitals.

3. The X-ray diffraction technique offers the most accurate method for determining bond lengths and bond angles in molecules in the solid state.

4. In recent years chemists have devoted much effort to developing a class of metallic compounds to serve as homogeneous catalysts.

5. The following examples illustrate the procedure for writing equilibrium constant expressions and calculating equilibrium constants and equilibrium concentrations.

6. A major concern in choosing the proper nuclear fusion process for energy production is the temperature necessary to carry out the process.

7. The problems of recycling unreacted starting materials and using heat generated in some intermediate step must also be solved in a pilot plan.

8. This phenomenon of going from gaseous to the liquid state is known as condensation.

9. Having surveyed some of the units used in chemistry, we are now ready to take a closer look at two techniques for handling numbers associated with measurements: scientific notation and significant figures.

10. There are two common methods of measuring angular velocity.

11. The second question in the choice of a lubricating device is its size.

12. These electrons are attracted by the positive charge which the plate has as a result of having been connected to the plus terminal of a battery.

13. Experiment has shown that the opposition of a body to being set in transition is proportional to the mass of the body and does not depend on anything else.

14. The fact of a new device having provided the means of silencing the airplane noise was a new step in the development of aviation technique.

15. The method of finding the resultant of a number of intersecting forces has been explained in Chapter I.

16. Scientifically speaking, energy is the capacity of doing work.

17. A sufficient development of the theory of transformation leads to the theory of expanding an arbitrary function in series of characteristic functions of Sturm – Liouville systems.

18. The rate of cooling is not important, although rapid cooling may impair the flatness of the material.

19. There are different methods of generating high-frequency current for heating.

20. Various methods of cooling transformers are adopted in practice, depending upon the size and the local conditions.

УПРАЖНЕНИЕ 5. Выделите герундий в функции обстоятельства и переведите следующие предложения на русский язык.

1. In spite of Rutherford's success in explaining atomic structure, one major problem remained unsolved.

2. In discussing energy changes of this type, we can label the reacting mixture (hydrogen, oxygen, and water molecules) the system and the rest of the universe the surroundings.

3. The emission of a substance is obtained by energizing a sample of material either with thermal energy or with some other energy form (such as a high- voltage electrical discharge, if the substance is gaseous).

4. In 1905, after testing literally thousands of compounds at various temperatures and pressures, Fritz Haber discovered that iron plus a few percent of oxides of potassium and aluminum catalyze the reaction of hydrogen with nitrogen to yield ammonia at about 500°C . (gerund)

5. Before closing this section, we should note the two following important rules about writing equilibrium constants.

6. A metal's ability to conduct electricity decreases with increasing temperature, because the enhanced vibration of atoms at higher temperatures tends to disrupt the flow of electrons.

7. The radiation to which the patient is exposed must be sufficient to destroy cancer cells without killing too many normal cells and, it is hoped, without inducing another form of cancer.

8. In addition to elucidating the structure of DNA, for which he was a co- recipient of the Nobel Prize in medicine and physiology in 1962, Crick has made many significant contributions to molecular biology.

9. Besides being a valuable fuel, coal is also a source of many chemicals essential to the chemical industry.

10. The copper metal obtained by roasting copper sulfide usually contains a number of impurities such as zinc, iron, silver, and gold.

11. The rheostat is usually equipped with one switch designed for changing the length of the resistance wire through which the current must pass.

12. On entering the lens, the rays are bent toward the normal as before and, on leaving the lens, they are bent away from the principal axis.

13. We discuss motion of rotation about a fixed axis without inquiring into the "causes" of the motion.

14. In spite of its having been compressed, the gas returns to its original volume as soon as the applied force is removed.

15. A steam engine uses steam made by fuel having been burnt outside the engine.

16. In making Bessemer steel, molten iron direct from the blast furnace is poured into the converter.

17. After introducing new technology in that branch of industry, some changes must be made as soon as possible.

18. The ratio is determined by dividing the value of the velocity or pressure at the point nearer the transmitting end by the value of the velocity at the point more remote.

19. In passing from the nozzle through one set of blades, the velocity of the steam is lowered.

20. The kinetic energies of α -particles are deduced from observations of the distance they travel in the air before being brought to rest by collisions.

21. Because of gas density being independent of temperature, gas tubes have a distinct advantage over those filled with a metallic vapour such as mercury.

22. The radiation reaching the earth from the sun does a great many things besides lighting and warming the earth and its atmosphere.

23. The Indian method of lighting a fire by rubbing a stick rapidly against another one is another illustration of heat produced because of motion.

24. By employing a number of amplifying tubes in cascade, almost any desired amount of amplification can be obtained.

25. We shall begin this part of the subject by discussing motion of rotation about a fixed axis, for example, the motion of a grinding wheel of an engine.

УПРАЖНЕНИЕ 6. Определите форму и функцию герундия в предложениях и переведите их на русский язык.

1. Information gained by studying these rays and their effects on other materials contributed greatly to the growing understanding of the structure of the atom.

2. Their high intensity and ease of focus make them suitable for doing eye surgery, for drilling holes in metals and welding, and for carrying out nuclear fusion.

3. Chemists and physicists have learned to get around this kind of difficulty by using methods of approximation.

4. In fact, the quantum mechanical study of chemical bonding also provides a means for understanding molecular geometry.

5. Although the operation of a battery is similar in principle to that of the galvanic cells, a battery has the advantage of being completely self-contained and requiring no auxiliary components such as salt bridges.

6. One very useful method for carrying out such separation is called flotation; in this process the ore is finely ground and added to water containing oil and detergent.

7. The development in recent years of processes for converting this by-product to sulfuric acid instead of releasing it into the air has helped to reduce SO₂ emissions in some parts of the country.

8. Some of the interstitial hydrides we have discussed are suitable candidates for storing hydrogen gas.

9. In studying the stability of the atomic nucleus, it is helpful to know something about its density, because it tells us how tightly the particles are packed together.

10. The coal reserve in this country is so large that we can continue using it at the present level for well over another thousand years.

11. Diethyl ether, commonly known as “ether”, was used as an anesthetic for many years; it produces unconsciousness by depressing the activity of the central nervous system.

12. Many synthetic isotopes are prepared by using neutrons as projectiles; this particularly convenient because neutrons carry no charges and therefore are not repelled by the targets- the nuclei.

13. Most of nuclear reactors are installations usually consisting of the following elementary parts: a moderator, heat-removing means, and a hermetic structure in which a chain reaction can be maintained.

14. In developing the fundamental equations of viscous flow, it will be seen that the problem is very similar to that of the shearing stress and strain in a solid.

15. Generally speaking, doing work on an object simply means transferring energy to that object.

16. Lines used in making drawings are made up of various widths and types, such as dashes with long and short breaks, wavy or jagged, etc.

17. In using wireless for control, instead of turning the electrical vibrations into the movements of a diaphragm which then produces sounds, they are used directly for opening or closing switches.

18. When the water motor is disconnected from the circuit by closing valves on both sides of it, there will be a high pressure built up due to the paddle wheel tending to force water against the closed valve.

19. One method extracts potash from surface deposits in salt lakes and the other two work on underground deposits either by mining the solid in a fashion similar to coal mining or by dissolving the potassium salts and transporting the solution to the surface for processing.

20. For this reason, the huge quantities of water that are present in our lakes and oceans can effectively moderate the climate of adjacent land areas by absorbing heat in summer and giving off heat in winter, with only small changes in the temperature of the of water.

УПРАЖНЕНИЕ 7. Выделите в следующих предложениях отглагольное существительное и терминологический герундий. Переведите предложения на русский язык.

1. Information gained by studying these rays and their effects on other materials contributed greatly to the growing understanding of the structure of the atom.

2. Phosphoric acid is used in soft drinks to give them the “tangy” flavor and phosphates are found in products like baking soda.

3. Thus, the heat generated by the combustion process is transferred from the system to its surroundings.

4. Most physical and chemical changes, including those that take place in living systems, occur in the constant- pressure conditions of our atmosphere.

5. The equations representing the melting of ice and the combustion of methane not only represent the mass relationships involved but also show the enthalpy changes.

6. A number of physical properties, including density, melting point, and boiling point, are related to the sizes of atoms, but atomic size is difficult to define.

7. A liquid can be temporarily cooled to below its freezing point.

8. In recent years benzene is almost exclusively obtained from petroleum in a process called catalytic reforming.

9. Under controlled conditions, suitable cooking oils and margarine may be prepared by hydrogenation from vegetable oils extracted from cottonseed, corn, and soybeans.

10. The compounds, known commercially as Freons, are used as aerosol propellants in spray cans, as a coolant in air- conditioning refrigeration, as solvents to clean electronic circuit boards, and in the manufacture of plastic foams.

11. This chapter discusses several different types of equilibrium, the meaning of the equilibrium constant, and factors that affect the attainment of equilibrium.

12. These qualities make the mercury battery ideal for use in pacemakers, hearing aids, electric watches, and light meters.

13. Steel hardware, electric watches, and light meters, including nuts and bolts, is often coated with a thin cadmium plating.

14. The metallurgical processing of iron involves the chemical reduction of the minerals by carbon (in the form of coke) in a blast furnace.

15. A number of elements have properties that are intermediate between those of metals and nonmetals and are therefore called semi-conducting elements.

16. For many years, farmers have used lime to lower the acidity of soil for their crops (a process called liming), and nowadays liming is also applied to lakes affected by acid rain.

17. It was once thought that radon was only released over mining sites; particularly uranium and phosphate mines, which have high concentrations of uranium.

18. This is the basis for ongoing research into the harnessing of nuclear fusion for the production of energy.

19. Radiation damage to living systems is generally classified as somatic or genetic; genetic damage means inheritable changes or gene mutations, for example, a person whose chromosomes have been damaged or altered by radiation may have deformed offspring.

20. Hydrogen is also obtained as a by-product of petroleum refining.

21. The electric arc is used for welding two or more pieces of metal; the tremendous amount of heat being presented when the current moves from one electrode to the other in a welding machine.

22. Very small transformers are cooled by the atmosphere, no special cooling arrangements being necessary.

23. In roll size drawings, the drawing number and the title are also placed on the back in order that they can be read when the drawing is rolled.

24. Discs utilizing copper oxide coatings are used for rectification at low voltages.

УПРАЖНЕНИЕ 8. Сводное (контрольное). Переведите следующие предложения на русский язык, определив форму и функцию герундия.

1. A simple barometer can be constructed by filling a long glass tube, closed at one end, with mercury, and then carefully inverting the tube in a dish of mercury, making sure that no air enters the tube.

2. In thermodynamics, work has a broader meaning that includes mechanical work (for example, a crane lifting a steel beam), electrical work (a battery supplying electrons to light the bulb of a flashing light), and so on.

3. By passing a beam of electrons through a thin piece of gold foil, Thomson obtained a set of concentric rings on a screen, similar to the pattern observed when X-rays (which are waves) were used.

4. In discussing the properties of many-electron atoms, the concept of effective nuclear charge is quite useful.

5. After all, most chemical reactions involve the making and breaking of bonds.

6. It is estimated that every year in the United States up to 100,000 billion gallons of water are used for industrial cooling, mostly in electric power and nuclear power production.

7. Cobalt is a bright, bluish-white metal; it is used in alloys such as stellite, an alloy containing cobalt, chromium, and tungsten; the stellite is used in making surgical instruments.

8. Esters are used in the manufacture of perfumes and as flavoring agents in the confectionary and soft-drink industries.

9. Aluminum recycling is economically sound and avoids further damage to the environment from mining.

10. The answers to these and other similar questions can usually be obtained by applying chemical kinetics and the radiocarbon dating technique.

11. One method extracts potash from surface deposits in salt lakes and the other two work on underground deposits either by mining the solid in a fashion similar to coal mining or by dissolving the potassium salts and transporting the solution to the surface for processing.

УПРАЖНЕНИЕ 9. Сводное. Перевод и анализ -ing- форм.

1. Figure 7.21 shows the two possible spinning motions of an electron, one clockwise and the other counterclockwise.

2. The following examples illustrate the procedure for calculating the number of electrons in orbitals and labeling electrons with the four quantum numbers.

3. The boiling points of substances often reflect the strength of the intermolecular forces operating among the molecules.

4. Mercury dissolves the silver and gold in an ore to form a liquid amalgam, which is easily separated from the remaining ore; the gold or silver is then recovered by distilling off the mercury.

5. However, supplies of oil and natural gas are being depleted at an alarming rate, and research is under way to devise ways of making coal a more versatile source of energy.

6. Another problem, this one associated with the burning of coal, is the formation of sulfur dioxide from the sulfur- containing compounds.

7. Oxygen is a fundamental building block of practically all vital bio- molecules, accounting for about a fourth of the atoms in living matter; without it, a human being cannot survive for more than a few minutes.

8. Oxygen is also used as a bleaching agent for pulp and paper, in medicine to ease breathing difficulties, in oxyacetylene torches, and as an oxidizing agent in many inorganic and organic reactions.

9. Certain strains of soybeans growing in alkaline soil, which favors the formation of iron hydroxides, generate and secrete into the soil chelating agents that solubilize the iron needed for plant growth.

10. This property makes possible a nuclear chain reaction, which is a self- sustaining sequence of nuclear fission reactions.

11. In less than a second, the reaction can become uncontrollable, liberating a tremendous amount of heat to the surroundings.

12. The results of example 18.2 are consistent with many other reactions, which allow us to state the following general rules.

13. In modern dentistry the material most commonly used for filling decaying teeth is a composition known as dental amalgam.

14. In naturally occurring uranium minerals we should and do find some lead- 206 isotopes formed by radioactive decay.

15. The properties of Laplace transformation that we have derived up to this point enable us to solve many problems in engineering and physics involving ordinary and partial differential equations.

ГЛАВА 5. ПЕРЕВОД ИНФИНИТИВНЫХ ОБОРОТОВ И КОНСТРУКЦИЙ

Инфинитив является основной глагольной формой, от которой образуются все личные формы глагола во всех группах английских времен в действительном и страдательном залоге. Категория времени у инфинитива носит относительный характер и не имеет самостоятельного временного значения. В английском языке имеются следующие формы инфинитива.

Infinitive Simple употребляется для обозначения действия, одновременного с действием, которое выражается глаголом-сказуемым в личной форме.

Infinitive Continuous обозначает действие в процессе его развития одновременно с действием, которое выражается глаголом-сказуемым в личной форме.

Infinitive Perfect обозначает действие, которое предшествует действию, выраженному глаголом-сказуемым.

Infinitive Perfect Continuous обозначает действие, продолжавшееся в течение определенного периода времени и предшествовавшее действию, выраженному глаголом-сказуемым.

Все формы инфинитива страдательного залога указывают на то, что действие, выраженное инфинитивом, направлено на лицо или предмет.

	Active	Passive
Simple Infinitive	to translate	to be translated
Continuous Infinitive	to be translating	-
Perfect Infinitive	to have translated	to have been translated
Perfect Continuous	to have been translating	-

Способ перевода инфинитива на русский язык зависит от его функции в предложении. Являясь неличной формой глагола, инфинитив выполняет в предложении следующие синтаксические функции, а именно: подлежащего, дополнения, обстоятельства, определения, именной части составного именного сказуемого и части составного глагольного сказуемого.

<p>1. Инфинитив в функции подлежащего переводится неопределенной формой глагола.</p> <p>2. Инфинитив а) как часть именного сказуемого после подлежащего переводится неопределенной формой глагола. б) как составное глагольное сказуемое после глаголов, обозначающих начало, протекание и завершение процессов и как модальное сказуемое, после модальных глаголов.</p> <p>3. Инфинитив в функции дополнения переводится: а) неопределенной формой, если используется в простых формах и б) придаточным дополнительным предложением с союзом что или чтобы.</p> <p>4. Инфинитив в функции определения стоит сразу <u>после существительного</u> и</p>	<p><u>To prove</u> this law experimentally is very difficult.</p> <p>It is difficult <u>to prove</u> this law.</p> <p>Your work is to observe the rise of temperature.</p> <p>The aim of our research work is to find the necessary data for our experiments.</p> <p>Nuclear physics <u>began to play</u> a leading role in the 20-th century.</p> <p>Chemists <u>try to find</u> new methods of inorganic polymer synthesis.</p> <p>A rocket engine <u>must combine</u> very small weight with immense power.</p> <p>He likes <u>to speak</u> with us on this subject.</p> <p>The engineers were glad <u>to have obtained</u> such good results in the latest tests of the new model.</p> <p>The experiments have shown that the amount of <u>work to be used</u> for producing a given amount of heat is the same under all</p>	<p><u>Доказать</u> этот закон экспериментально очень трудно.</p> <p>Трудно <u>доказать</u> этот закон.</p> <p>Ваша работа заключается в том, чтобы наблюдать за повышением температуры.</p> <p>Цель наших исследований состоит в том, чтобы найти необходимые данные для наших опытов.</p> <p>Ядерная физика <u>начала играть</u> ведущую роль в 20 веке.</p> <p>Химики <u>пытаются найти</u> новые способы неорганического синтеза полимеров.</p> <p>Ракетный двигатель <u>должен сочетать</u> небольшой вес и огромную мощность.</p> <p>Он любит <u>говорить</u> с нами на эту тему.</p> <p>Инженеры были рады, <u>что достигли</u> таких хороших результатов при последних испытаниях новой модели.</p> <p>Опыты показали, что количество <u>работы, которое необходимо</u></p>
--	---	--

переводится придаточным определительным предложением с добавлением слов следует, должен, необходимо.	conditions.	<u>израсходовать</u> для получения данного количества тепла, является одинаковым при всех условиях.
--	-------------	---

Инфинитив кроме прямых функций участвует в образовании сложных инфинитивных оборотов. Такие обороты в английском языке встречаются очень широко и всегда равнозначны придаточным предложениям.

1. Объектный инфинитивный оборот (Complex Object) или косвенное дополнение - это сочетание имени существительного в общем падеже или местоимения в объектном (косвенном) падеже с инфинитивом, которое выступает как единый член предложения – сложное дополнение. Следует отметить, что сложное дополнение употребляется после глаголов с широким кругом значений. Этот оборот обычно переводится на русский язык придаточным дополнительным предложением с союзами что или чтобы, причем инфинитив будет переводиться глаголом-сказуемым в соответствующем времени.

Пример: He asked the engineer to define the unit of resistance more accurately.

Перевод: Он попросил, чтобы инженер определил единицу сопротивления более точно.

Пример: We thought them to have taken part in that expedition.

Перевод: Мы думали, что они принимали участие в той экспедиции.

Пример: We know him to be the first inventor of an electrical measuring instrument.

Перевод: Мы знаем, что он является первым изобретателем электрического измерительного прибора.

Пример: We expect the design of this engine to be published in the latest issue of the magazine.

Перевод: Мы ожидаем, что конструкция этого двигателя будет опубликована в последнем номере журнала.

Следует знать, что инфинитив в этом обороте употребляется без частицы to после глаголов to hear, to see, to watch, to notice, to feel, to make, to help по правилам английской грамматики.

Пример: We see the water boil in the boiler.

Перевод: мы видим, что вода кипит в котле.

2. Субъектный инфинитивный оборот (Subjective with the Infinitive Construction) представляет собой сложноподчиненное предложение, в котором главное предложение выражено глаголом в страдательном залоге, а придаточная часть состоит из существительного или личного местоимения и инфинитива, связанного с ним по смыслу.

Перевод всей конструкции обычно начинается со сказуемого главного предложения, которое переводится на русский язык неопределенно-личным предложением (напр. говорят, сообщают). Существительное или местоимение становится подлежащим русского придаточного дополнительного предложения, а инфинитив его сказуемым, согласующимся с ним в лице и числе.

Пример: The atom is said to be the smallest part of a substance.

Перевод: Говорят, что атом является мельчайшей частицей любого вещества.

Пример: This discovery is considered to be of special value for this branch of industry.

Перевод: Считается, что это открытие представляет особую важность для этой отрасли промышленности.

Субъектный оборот также может употребляться с отдельными глаголами, которые по своему значению тоже связаны с познавательными процессами, а именно, глаголы to appear (оказаться), to turn out (оказываться), to seem (казаться), to happen (случаться) и to prove (доказывать). В научно-технической литературе глаголы to appear и to happen в субъектном обороте часто переводятся

словами: по-видимому, случайно. Эти глаголы стоят в главном предложении только в действительном залоге.

Пример: The variety of purposes electricity is used for nowadays seems to be endless.

Перевод: Кажется, что сегодня разнообразные возможности применения электричества являются бесконечными.

Пример: The Moon and Venus appear to possess very weak magnetic fields.

Перевод: Оказывается, что Луна и Венера обладают очень слабыми магнитными полями.

Пример: At present the most important examples of semiconductors turned out to be silicon and germanium.

Перевод: Оказалось, что в настоящее время самими важными примерами полупроводников являются кремний и германий.

Субъектный инфинитивный оборот также употребляется с устойчивыми выражениями to be likely (вероятно), to be unlikely (маловероятно), to be certain (определенно, несомненно), to be sure (обязательно), которые занимают место глагола в главной части. Перевод таких предложений осуществляется по той же схеме, как и предыдущие конструкции.

Пример: Under these conditions the output is likely to increase.

Перевод: Вероятно, (что) при этих условиях выпуск продукции увеличится.

Пример: The construction of this dam is certain to be completed in two months.

Перевод: Несомненно, (что) строительство этой дамбы будет завершено через два месяца.

5. Инфинитив может иметь функцию обстоятельства цели, если стоит после союза in order (to) для того, чтобы. Такой инфинитивный оборот будет переводиться на русский язык придаточным обстоятельственным оборотом или существительным с предлогом для. Инфинитивный оборот цели обычно стоит в начале английского

предложения и всегда выделяется запятой, чтобы не путать его другой функцией инфинитива как подлежащего. Если же такой оборот стоит в конце предложения, то запятая отсутствует.

Пример: To make the resistance of the voltmeter large, a coil of high resistance is placed in series with the moving coil.

Перевод: Для того, чтобы делать сопротивление вольтметра высоким, к подвижной катушке последовательно подключают катушку с большим сопротивлением.

И в завершении описания функций инфинитива следует отметить еще одну конструкцию с инфинитивом, где инфинитив участвует в образовании сложного оборота, имеющего дополнительное значение после глаголов to find, to consider, to make, to think. В этом обороте формальное слово it на русский язык не переводится, а инфинитив имеет формальную функцию дополнения. Чаще всего такая конструкция переводится одним распространенным предложением.

Пример: We consider it necessary to find the data to proceed with our experiments.

Перевод: Мы считаем необходимым (что?) найти данные для продолжения наших опытов.

Упражнение 1. Выделите инфинитив в функции подлежащего. Переведите предложения на русский язык.

1. Before we discuss reactions involving these compounds, it is useful first to examine their general properties and definitions.

2. Since it is not possible to form methane by reacting hydrogen gas with graphite, there is no way of directly measuring the enthalpy change.

3. It took a long time to realize- and an even longer time to accept- that the properties of atoms and molecules are not governed by the same laws that works so well for larger objects.

4. This concept was totally alien to the way physicists had thought about matter and radiation, and it took a long time for them to accept it.

5. According to the laws of optics, it is impossible to form an image of an object that is smaller than half the wave-length of the light used for the observation.

6. Finally, it is useful to remember the following facts about electron shielding.

7. It takes considerably more energy to remove the second electron.

8. It is important to understand the choice of concentration unit here.

9. Note that it is possible to change the pressure of a system without changing its volume.

10. The lead storage battery can deliver large amounts of current for a short time, such as the time it takes to start up the engine.

11. Because of these undesirable properties there is a need to limit its use.

12. On the other hand, it is certainly convenient to think of orbitals in terms of specific shapes, particularly in discussing the formation of chemical bonds between atoms.

13. For this reason, it is important to indicate the margin of error in a measurement by clearly indicating the number of significant figures, which are the meaningful digits in a measured or calculated quantity.

14. In graduating the altimeter, it is necessary to assume an ideal atmosphere and usually the temperature of this atmosphere is taken as being 50°F.

15. To build up a magnetic field requires the expenditure of a certain amount of energy.

16. It is essential for the operators to be screened behind the lead baffles and tanks of water which absorb the neutrons produced.

17. It is impossible for the molecules in one layer to vibrate without setting the molecules in the neighbouring layers in vibration.

Упражнение 2. Выделите инфинитив в функции сказуемого. Переведите предложения на русский язык.

1. Another way to observe the non-ideality of gases is to lower the temperature.

2. Cooling a gas decreases the molecules' average kinetic energy, which in a sense deprives molecules of the drive they need to break away from their mutual attractive influences.

3. The characteristic lines in atomic spectra can be used in chemical analysis to identify unknown atoms, much as fingerprints are used to identify people.

4. One approach is to make use of the known boiling points of the element's immediate neighbors in the same group.

5. One way to compare the properties of the representative elements across a period is to examine the properties of a series of similar compounds.

6. In Chapter 5 we saw how the kinetic molecular theory could be used to explain the behavior of gases.

7. The structure of metallic crystals is the simplest to deal with, since every lattice point in a crystal is occupied by an atom of the same metal; metallic crystals are generally body-centered cubic, or hexagonal close-packed.

8. The other factor that needs to be considered is the disorder or randomness that results when solvent molecules mix to form a solution.

9. These examples give some idea of how inventive chemists must be in studying reaction mechanisms, but you must realize that for complex reactions it is impossible to prove the uniqueness of any particular mechanism.

10. Your first step is to take a careful look at the balanced equation for the production of ammonia.

11. Your main objective is to obtain a high yield of the product while keeping the production costs down.

12. The best way to fight tooth decay is to eat a diet low in sugar and always brush one's teeth immediately after eating.

13. The most obvious approach is to coat the metal surface with paint.

14. Our first step is to calculate the quantity of charge in coulombs passing through the cell.

15. As you know, hydrogen gas can be obtained from water by electrolysis, but this method consumed too much energy; a more attractive approach, which is currently in the early stages of development, is to use solar energy to "split" water molecules.

16. The earliest practical use of helium was to replace hydrogen as a lifting gas in balloons.

17. The following characteristics of the transition metals are both interesting to consider and important to understand.

18. Like the magnetic confinement approach, laser fusion presents a number of technical difficulties that still need to be overcome before it can be put to practical use on a large scale.

19. The basic activities of the chemical industry are to isolate raw materials and to prepare key intermediates and finished products.

20. The best way to understand the current is to see how it acts in a circuit.

21. The first step is to construct a force diagram showing all of the forces exerted on the block.

22. The chief reason for the use of such bearings in machinery is to reduce wear and simplify lubrication problems.

Упражнение 3. Выделите инфинитив в функции определения. Переведите предложения на русский язык.

1. Our ability to measure properties depends to a large degree on the current state of technology.

2. There are many ways to demonstrate the existence of atmospheric pressure. One example is our ability to drink through a straw.

3. The equation to solve this problem was formulated by Maxwell in 1860.

4. Attempts to account for this dependence in terms of established wave theory and thermodynamic laws were only partially successful.

5. The only way to resolve the dilemma is to accept the idea that light possesses both particle-like and wave-like properties.

6. Alkaline earth metals have no tendency to pick up an extra electron.

7. We observed earlier that oxygen has a tendency to form the oxide ion.

8. Eventually, at a sufficiently low temperature, the molecules no longer have enough energy to break away from one another's attraction.

9. We have seen that one property of liquids is their tendency to assume the shapes of their containers.

10. Furthermore, because of their shape the molecules have a great tendency to become entangled rather than to slip past one another as the molecules in less viscous liquids do.

11. Conversely, an effective way to preserve foods is to store them at subzero temperatures, thereby slowing the rate of bacterial decay.

12. Therefore we cannot compare the relative strengths of all acids on the basis of their readiness to lose a proton in aqueous solution.

13. There are many ways for the cards to be out of sequence but only one way for them to be ordered according to our definition.

14. The tendency for iron to oxidize is greatly reduced by alloying with certain other metals.

15. Ozone is mainly used to purify water, to deodorize air and sewage gases, and to bleach waxes, oils, and textiles.

16. No stable compounds of helium have ever been prepared; hence there is no chemistry of helium to speak of.

17. If nuclear fusion is so great, why isn't there even one fusion reactor producing energy? The basic problem is finding a way to hold the nuclei together long enough, and at the appropriate temperature, for fusion to occur.

18. During World War 2 a shortage of natural rubber in the US prompted an intensive program to produce synthetic rubber.

19. Effective ways to cool power plants while doing only minimal damage to the biological environment are being sought.

20. Because of these undesirable properties there is a need to limit its use.

21. The second condition of equilibrium is that the tendency to rotate should be zero.

22. Since heat and work are convertible, the most important thing to know about any device for this purpose is its efficiency.

23. One of the most important things for the pilot to know is how high he is flying.

24. The time required for the pulse to travel to and from the target is very short.

25. As the forces are balanced there will be no tendency for the vessel to move.

Упражнение 4. Выделите инфинитив в функции дополнения. Переведите предложения на русский язык.

1. Figure 2.17 shows the two allotropes of carbon- graphite and diamond. Looking at the figure, you may find it hard to believe that both substances are made of the same carbon atoms.

2. We frequently find it convenient to prepare a less concentrated solution from a more concentrated solution; the procedure for this preparation is called dilution.

3. In cases where the identity of the original compound is known, the gravimetric analysis technique allows us to determine the concentration of the solution containing the compound, as the next example shows.

4. Our discussion of calorimetry- that is, the measurement of heat changes- will depend on an understanding of specific heat and heat capacity, so let us consider them first.

5. Quantum theory allows us to predict and understand the critical role that electrons play in chemistry.

6. Radiant energy absorbed by the atom causes the electron to move from a lower- energy orbit to a higher- energy orbit.

7. Before we examine the periodic variations in chemical properties, we need to discuss two concepts that play important roles in determining whether atoms of the elements will preferentially form ionic or molecular compounds: ionization energy and electron affinity.

8. Ionization energy and electron affinity are two characteristics that help chemists understand the types of reactions that elements undergo and the nature of the elements' compounds.

9. Electro-negativity not only helps us draw the correct Lewis structures, but also enables us to distinguish between covalent compounds and ionic compounds.

10. However, there is a simple procedure that allows us to predict with considerable success the overall geometry of a molecule if we know the number of electrons surrounding a central atom.

11. The lack of strong forces between molecules allows a gas to expand to the volume of its container.

12. The surface tension of water causes this film to contract, and as it does, it pulls the water up the tube.

13. Since the boiling point is defined in terms of the vapor pressure of the liquid, we expect the boiling point to be related to the molar heat of vaporization.

14. In terms of the collision theory of chemical kinetics, then, we expect the rate of a reaction to be directly proportional to the number of molecular collisions per second, or to the frequency of molecular collisions.

15. Alternating the polarity (that is, + and-) on specially constructed plates causes the particles to accelerate along a spiral path.

16. Although we command the scientific knowledge to design such a reactor, the technical difficulties have not yet been solved.

17. We know an alternating current to be continually changing by rising, falling and changing direction.

18. We know pressure to be required for forcing water through a pipe.

19. We know the cell to be consisted of two plates of conducting material assembled together and immersed in an electrolyte.

20. We assume the gas to be an invisible weightless fluid called "caloric".

21. Suppose a given number of electrons to make their way between the ions of a copper wire.

22. Heat absorbed by a liquid causes the liquid to evaporate.

23. We want you to take into consideration that voltage, resistance and capacity are the three important properties to influence the flow of current in an electric circuit.

24. During daytime the land near the coast becomes warmer than the near-by sea and this causes the air over the land to warm up.

25. The open-ended tube allows the full force of the air flow to pass along the metallic tube to the instrument in the cockpit which contains a diaphragm.

Упражнение 5. Выделите инфинитив в функции обстоятельства. Переведите предложения на русский язык.

1. The second hypothesis suggests that, in order to form a certain compound, we need not only atoms of the right kinds of elements, but the correct numbers of these atoms as well.

2. To denote molecules we combine these symbols into chemical formulas.

3. To begin our study of nomenclature, the naming of chemical compounds, we must first distinguish between inorganic and organic compounds.

4. The largest consumer of lime is the steel industry, which uses the basic properties of lime to remove acidic impurities in iron ores.

5. Thus even in the case of helium, which contains two electrons, the mathematics becomes too complex to handle.

6. However, like everything else in science the standard group notation in the periodic table continues to change in order to reflect new discoveries, trends, and developments.

7. Thus liquids are much more difficult to compress than gases and much denser under normal conditions.

8. To see how the rate of a chemical reaction is actually measured, we will consider a specific example: the reaction of molecular bromine with formic acid.

9. To distinguish this rate from the average rate, we call it the instantaneous rate.

10. Most metals occur in nature in a chemically combined state as minerals; a mineral deposit concentrated enough to allow economical recovery of a desired metal is known as ore.

11. The alkali metals have low melting points and are soft enough to be sliced with a knife; these metals all possess a body-centered crystal structure with low packing efficiency.

12. To react with the aluminum nuclei, the α -particles must have considerable kinetic energy in order to overcome the electrostatic repulsion between themselves and the target atoms.

13. In nuclear fission a heavy nucleus (mass number >200) divides to form smaller nuclei of intermediate mass and one or more neutrons.

14. It is estimated that the human body contains about 100,000 different kinds of protein molecules; to understand the properties of a protein molecule, we must know its structure.

15. The work of Pauling's group was a great triumph in protein chemistry; it showed for the first time how to predict a protein structure purely from the knowledge of the geometry of its fundamental building blocks.

16. To find the state of a mass of a gas, we must know three things about it, namely, its volume, its pressure and its temperature.

17. To compare sources of illumination, a standard source of illumination is necessary.

18. Scale maps are miniature representations of the Earth's surface with various recognized symbols to show certain features.

19. A small condenser and resistor are attached across the contacts to save the contacts from burning.

20. Scale maps are miniature representations of the Earth's surface with various recognized symbols to show certain features.

21. The air must be compressed to occupy a smaller volume.

22. One must know beforehand whether sufficient current will flow through the circuit in order to perform the work to be done.

23. To be properly understood, the rules of safe work is to be explained once more.

24. For the system of forces to be in equilibrium, each force must be the equilibrant of the system.

25. To cut down the flow of water in a given pipe you need to shut off a valve in that pipe.

Упражнение 6. Определите форму и функцию инфинитива в предложениях и переведите их на русский язык.

1. Perhaps the best way to appreciate the scientific method is to follow the steps of scientists in solving a particular problem.

2. To see how quantum mechanics changed our view of the atom, let us look at the very simplest atom, the hydrogen atom, with one proton and one electron.

3. To take the electron spin into account, it is necessary to introduce a fourth quantum number, called the electron spin quantum number.

4. One way to illustrate the effect of electron shielding is to look at the energy required to remove an electron from a many- electron atom.

5. The terms “electrical conductivity” and “thermal conductivity” are used qualitatively here to indicate an element’s ability to conduct electricity and heat.

6. Another property of atoms that greatly influences their chemical behavior is their ability to accept one or more electrons.

7. To illustrate what we mean by the study of reaction mechanism, let us consider the reaction between nitric oxide and oxygen.

8. First, we collect data (measurements of rates). Second, we analyze these data to determine the rate constant and the order of the reaction, and we write the rate law.

9. In general, the equilibrium constant helps us to predict the direction in which a reaction mixture will proceed to achieve equilibrium and to calculate the concentrations of reactants and products once equilibrium had been reached.

10. Keep in mind that equation 15.3 is simply a definition designed to give us convenient numbers to work with.

11. The advantages of using interstitial hydrides are as follows: (1) many metals have a high capacity to take up hydrogen gas- sometimes up to three times as many hydrogen atoms as there are metal atoms; (2) because these hydrides are solids, they can be stored and transported more easily than gases or liquids.

12. Most helium produced today is used in the space industry to pressurize rocket fuels, as a coolant, and as a substance to dilute oxygen gas in spacecraft atmospheres.

13. For a chain reaction to occur, enough uranium-235 must be present in the sample to capture the neutrons.

14. A large - scale experiment is under way to use bacteria to break down the crude oil spilled by oil tankers.

15. To be sure, it will take a tremendous effort (both time and money) to clean up our land, water, and air, but this is a small price to pay considering that the future of the Planet is at stake.

16. To begin learning how a diesel engine works, let's see what happens inside the engine, step by step.

17. To reduce the problem to its essential terms, imagine that the cylinders are of nearly the same size so that the liquid layer between them is small.

18. The problems of jet propulsion and gas dynamics to have been discussed in detail were only mentioned.

19. This model needs to be constructed by placing on the horizontal surface portions of cylinders which directrices are similar to those of the electrodes under investigation.

20. Some forces should be applied to the control surfaces to overcome the stability of the airplane.

21. We know the velocity of a particle to be continuously changing if this particle has non-uniform motion.

22. There is a natural tendency for all carburetors to give an increasingly rich mixture as engine speed and altitude increases.

23. To find the power of an alternating current it is necessary to multiply the effective current by the effective voltage provided the current and voltage are in phase.

24. In flight aircraft must report their position and the most obvious way to do it is to give the bearings and distance of the aircraft from any well-known landmark, light house or light-vessel.

25. As to aluminum, one of the difficulties to be overcome is that the temperature range over which aluminum can be forged satisfactorily is rather narrow.

Упражнение 7. Выделите в предложениях субъектный инфинитивный оборот и переведите их на русский язык.

1. A chemical element is said to exhibit allotropy when it occurs in two or more forms; the forms are called allotropes.

2. An element is said to be oxidized if its oxidation number increases in a reaction; if the oxidation number of the element decreases in a reaction, it is said to be reduced.

3. Thus, diffusion of gases always happens gradually, and not instantly as molecular speeds seem to suggest.

4. A gas that satisfies these two conditions is said to exhibit ideal behavior.

5. Bohr's treatment is very complex and is no longer considered to be correct in all its details.

6. Such discrepancies suggest that some fundamental property other than atomic mass is the basis of the observed periodicity; this property turned out to be associated with atomic number.

7. Thus each pair of these elements is said to exhibit a diagonal relationship.

8. Two atoms held together by one electron pair are said to be joined by a single bond.

9. One feature of Kevlar's structure which is thought to contribute to its unusual strength is the fact that it is quite rigid.

10. Benzene is a toxic substance and is considered to be a carcinogen.

11. It seems logical to assume- and it is generally true- that chemical reactions occur as a result of collisions between reacting molecules.

12. The inability of a solvent to differentiate among the relative strengths of all acids stronger than the solvent's conjugate acid is known as the leveling effect because the solvent is said to level the strengths of these acids, making them seem identical.

13. A reaction that does occur under the given set of conditions is called a spontaneous reaction; if it does not occur under that set of conditions, it is said to be non-spontaneous.

14. This quantity turns out to be entropy, as we will see shortly. A new deck of cards is arranged in an ordered fashion (the cards are from ace to king and the suits are in the order of spades to hearts to diamonds to clubs), but once the deck is shuffled, the cards appear disordered both in numerical and in suit sequence.

15. Although the reactions involved are quite complex and not completely understood, the main steps are believed to be as follows.

16. A number of methods have been devised to protect metals from corrosion.

17. Although the transition metals are less electropositive (or more electronegative) than the alkali and alkaline earth metals, their standard reduction potentials seem to indicate that all of them except copper should react with strong acids such as hydrochloric acid to produce hydrogen gas.

18. Plants deficient in iron are likely to develop a disorder known as iron chlorosis, evidenced by yellowing leaves; iron chlorosis particularly affects the yield of fruit from citrus trees.

19. In this situation the mass of the sample is said to be subcritical.

20. Alkanes are generally not considered to be very reactive substances. However, under suitable conditions they undergo several kinds of reactions- including combustion.

Упражнение 8. Переведите предложения с субъектным инфинитивным оборотом на русский язык.

1. Even in cases when a chemical is known to be totally harmless to humans and vegetation, its long-termed effect on the environment cannot be easily assessed.

2. α -rays or α -particles were found to be particles with a positive charge of +2.

3. The nature of radiation that was doing this was not known, although it seemed to resemble X-rays in being highly energetic and not consisting of charged particles.

4. Any element, such as uranium, that exhibits radioactivity is said to be radioactive.

5. Real water vapour and steam are known to be completely invisible.

6. A rod of ebonite which has been rubbed with flannel is found to have the property of attracting light objects such as pieces of paper, cork, etc.

7. 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.

8. A book lying on the table is expected to keep its position without difficulty as one knows it to be in a state of equilibrium.

9. Heat is said to reach the cooler end of the rod by conduction along or through the material of the rod.

10. All metals are known to consist of minute particles called molecules.

11. The turning effect of a force about a pivot is found to depend on the distance of the force from the pivot.

12. Because of the ability of attracting iron this ore is said to be a magnet.

13. The current and the voltage are said to have been out of phase with one another as the load of the current was inductive.

14. The cathode was reported to be able to give an emission of up to 800 amperes per square centimeter at 1.000°C .

15. The sun is known to represent a mass of condensed gases and vapours.

16. Certain properties of matter are considered to be always the same under definite conditions.

17. The number of protons was assumed to be sufficient to account for the atomic weight.

18. The acceleration of an automobile is said to be positive when force is supplied by the motor to speed up the car.

19. If the valve in the cylinder appears to move too easily, it should be replaced immediately.

20. Uranium is known to give off α , β , and γ - rays.

21. The melting point of ice is known to be lowered by the application of pressure.

Упражнение 9. Сводное (контрольное). Определить форму и функцию инфинитива. Перевести предложения на русский язык.

1. In chemistry, we often deal with numbers that are either extremely large or extremely small. These numbers are cumbersome to handle, and it is easy to make mistakes when using them in arithmetic computations. It would be easy for us to miss one zero or add more zero after the decimal point. To handle these very large and very small numbers, we use a system called scientific notation.

2. This statement seems obvious today, for we normally expect all molecules of a given compound to have the same composition, that is, to contain the same numbers of atoms of its constituent elements.

3. The importance and usefulness of the periodic table lie in the fact that we can use our understanding of the general properties and trends within a group or a period to predict with considerable accuracy the properties of any element, even though that element may be unfamiliar to us.

4. To estimate the enthalpy of a reaction, then, all we need to do is to count the total number of bonds broken and formed in the reaction and record all the corresponding energy changes.

5. To begin with, we will consider reactions in which the reactants and products are in the same phase.

6. Assuming that no lead was present when the mineral was formed and that the mineral has not undergone chemical changes that would allow the lead- 206 isotope to be separated from the parent uranium- 238, it is possible to estimate the age of the rocks from the mass ratio of Pb- 206 to U- 238.

7. It should be kept in mind that it is virtually impossible to anticipate all the problems of running a reaction on an industrial scale, and the many chemical engineers and chemists employed in the industry are constantly seeking ways to improve the efficiency of the process and to minimize pollution to the environment.

8. The neon atom is thus predicted to be diamagnetic, which is in accord with experimental observation.

9. Since an electron has no well-defined position in the atom, we find it convenient to use terms like electron density, electron charge, or charge cloud to represent the probability concept.

10. Quantum mechanics tells us that three quantum numbers are required to describe the distribution of electrons in hydrogen and other atoms.

11. In carrying out a dilution process, it is useful to remember that adding more solvent to a given amount of the stock solution changes (decreases) the concentration of the solution without changing the number of moles of solute present in the solution.

12. The most common alternating current for lighting and power purposes is assumed to go through 50 cycles in 1 second.

13. To charge an object by induction one should hold a charged body at some distance near the object to be charged.

14. We know copper to be distinguished by its red colour from all other metals.

15. Attempts to add copper and zinc in alloys for the production of sheet metal are known to have been at first unsuccessful because of the poor corrosion resistance of such sheets.

16. In that experiment the steam pipes are known to have been covered to reduce heat losses.

17. The natural tendency of heat to flow from a higher to a lower temperature makes it possible for a heat engine to transform heat into work.

18. If the forces have no tendency to increase or decrease the displacement, the body is considered to be in equilibrium.

ГЛАВА 6. ПЕРЕВОД МОДАЛЬНЫХ ГЛАГОЛОВ И ИХ ЭКВИВАЛЕНТОВ

Модальные глаголы и их эквиваленты	PRESENT	PAST	FUTURE
1. CAN (способность совершать действия) To be able to	CAN am is are able to	COULD was were able to	shall / will be able to
2. MAY (возможность, вероятность совершения действия) to be allowed to	MAY am is allowed to are	MIGHT was were allowed to	shall will be allowed to
3. MUST (выражает долженствование) To have to To be to	MUST have to, has to am is to are	had to was were to	shall have to will have to
4. SHOULD, OUGHT TO (выражают совет, обязательство с SIMPLE INFINITIVE) SHOULD, OUGHT TO + PERFECT INFINITIVE (используются для образования форм сослагательного наклонения)	SHOULD OUGHT TO		

<p>5. MUST, MAY, CANNOT+ PERFECT INFINITIVE (выражают определенные оттенки модальности)</p>	<p>This point <u>must have been the</u> centre of mass of the body. Эта точка, <u>должно быть,</u> <u>являлась</u> центром массы тела.</p>	<p>He <u>may have got</u> the article he needed. Он, <u>вероятно,</u> <u>достал</u> <u>статью,</u> которая была ему нужна.</p>	<p>He <u>cannot have made</u> such a serious mistake. <u>Не может быть,</u> чтобы он <u>допустил</u> такую серьезную ошибку.</p>
---	--	--	--

Упражнение 1. Переведите следующие предложения на русский язык, выделив модальные глаголы с Simple Infinitive Active.

1. Since the cathode ray is attracted by the plate bearing positive charges and repelled by the plate bearing negative charges, it is clear that it must consist of negatively charged particles.

2. Industrial processes usually involve products in huge quantities; thus, even a slight improvement in the yield can significantly reduce the cost of production.

3. Purely by accident, he noticed that a certain compound containing uranium was able to darken photographic plates that were wrapped in thick papers or even in thin metal sheets, without the stimulation of cathode rays.

4. Once we are able to recognize substances that usually exist as gases, we can infer their characteristic physical behavior from our understanding of this distinct state of matter.

5. Since it is neutral, every atom must contain an equal number of positive and negative charges, to maintain the electrical neutrality.

6. Changes in experimental conditions may disturb the balance and shift the equilibrium position so that more or less of the desired product is formed.

7. To begin with, we must realize that the strength of an acid depends on a number of factors, such as the properties of the solvent, the temperature, and, of course, the molecular structure of the acid.

8. To organize and simplify our venture into naming compounds, we can divide inorganic compounds into four categories: ionic compounds, molecular compounds, acids and bases, and hydrates.

9. To begin with, we should realize that in the vast majority of cases, reactions involving elements as reactants are redox reactions.

10. A 50 % alcohol solution of iodine, known as tincture of iodine, is used medicinally as an antiseptic; iodine deficiency in the diet may result in enlargement of the thyroid gland (known as goiter).

11. The success with xenon suggested that other noble gases might undergo similar reactions; that this is so should not be surprising to us.

12. You should note that “normal conditions” really represent a rather narrow range of temperature and pressure.

13. To make such a determination we would need to understand the nature and magnitude of the attractive forces among the molecules.

14. The following example shows that if we know the quantity, volume, and temperature of a gas, we can calculate its pressure using the ideal gas equation.

15. Steel containing 12% manganese is very hard and is used for railroad tracks and similar metal products that have to stand up under severe wear and tear.

16. In general, the stronger these attractions, the less likely that the compound can exist as a gas at ordinary temperatures.

17. When a radioactive nucleus disintegrates, the products formed may also be unstable and therefore will undergo further disintegration.

18. Mining, especially strip mining such as that used for coal and iron, is damaging to the environment, and it may take years for land to recover and vegetation to grow.

19. Classical physics had assumed that atoms and molecules could emit (or absorb) any arbitrary amount of radiant energy.

20. To maintain electrical neutrality, the charges on both ends of an electrically neutral diatomic molecule must be equal in magnitude and opposite in sign.

21. For a more complete explanation of chemical bond formation we must therefore look to quantum mechanics.

22. To understand the properties of condensed matter, we must understand the different types of intermolecular forces.

23. To understand why water is different, we have to examine the electronic structure of the H₂O molecule.

24. Depending on the information given, the calculation may be straightforward or complex.

Упражнение 2. Переведите предложения на русский язык, выделив модальные глаголы с Simple Infinitive Passive.

1. Further investigations showed that three types of rays can be emitted by radioactive elements. 2. It was found that two of the three types of rays could be deflected when they passed between two oppositely charged metal plates.

3. According to his description, an atom could be thought of as a uniform, positive sphere of matter in which electrons are embedded.

4. All atoms can be identified by the number of protons and neutrons they contain.

5. Two points regarding gravimetric analysis should be mentioned. First, this is a highly accurate technique, since the mass of samples can be measured accurately.

6. Before we explore the physical behavior of gases, we will briefly survey substances that might be expected to occur as gases (rather than liquids or solids) under normal conditions of pressure and temperature (that is, 1 atm and 25°C).

7. There are many compounds that cannot be directly synthesized from their elements; for example, the reaction of interest may proceed too slowly, or undesired side reactions may produce substances other than the compound of interest.

8. However, by taking an indirect route, that is, using data on reactions that can be readily studied in the laboratory, we are able to calculate the enthalpy of formation of methane.

9. The idea that energy should be quantized or “bundled” in this manner may seem strange at first, but the concept of quantization has many analogies.

10. The same equilibrium mixture could be obtained without the catalyst, but we might have to wait much longer for it to happen.

11. A unique feature of heat engines is that some heat must be given off to the surroundings when they do work.

12. Because free- energy change under conditions of constant pressure and temperature can be used to predict the outcome of a process.

13. In this manner, much more equipment can be packed into a small volume- a point of particular importance in space travel, as well as in hand-held calculators and microprocessors (computers- on- a-chip).

14. At first it was thought that a unique type of bonding might be involved in the noble gas compounds; this turned out to be incorrect.

15. All the chemicals used in industry have to be manufactured from raw materials available in nature.

16. It should be pointed out that other industries, automobiles, and domestic use all contribute heavily to various types of air pollution.

17. Waste chemicals must be stored in a safe site and constantly monitored.

18. One of the most serious cases of improper disposal of toxic waste was discovered in 1978 when an old chemical dump in Niagara Falls, New York, near Love Canal, began leaking into the environment; as a result, the neighborhood had to be evacuated.

19. Although light elements are generally not radioactive, they can be made so by bombarding their nuclei with appropriate particles.

20. Surface tension may be expressed in any unit of energy per unit of area.

21. The distance that an automobile may be driven without refueling is usually expressed in terms of miles and depends upon the terrain, condition of the road and the speed at which the car is to be driven.

Упражнение 3. Переведите предложения на русский язык, выделив модальные глаголы с Perfect Infinitive.

1. You may have noticed an interesting connection between hybridization and the octet rule.

2. From what we have said so far, you may have gathered the impression that the molar mass of a substance is found by examining its formula and summing the molar masses of its component atoms.

3. If you have visited the Carlsbad Caverns in New Mexico or other limestone caverns, you must have been impressed by the fantastic rock formations, called stalactites, which hang icicle-like from the cavern ceiling, and stalagmites, the columns that rise from the cavern floor.

4. When a magnet is broken in two, there will be two new poles; these poles must have existed in the original magnet but without producing external effects since they neutralized each other.

5. He may have gone to the library as he failed to find the necessary book at home.

6. The foreign matter such as sulphur and iron, which are found in coals to a varying degree, may have been due to the presence of minerals containing these elements in their neighbourhood.

7. Chalk is made up of the shells of little animals; they must have been tiny things, for you can only see the shells with a very strong glass.
8. He may have to stop his experiment.
9. Some mistakes must have been made in assembling the parts of the machine.
10. The authors suggested that denaturation may have occurred during preparation of the gamma globulin.
11. These poles must have existed in the original magnet.
12. It is not, however, difficult to see that there must have been a time when no such solid crust existed at all and when our Earth was a glowing globe of melted rocks.
13. The patience of the ancient forgerman must have been remarkable, since he first made his own steel by a slow process and lost a good percentage during the process.
14. A rough estimate of the rate of cooling and growth of the solid crust of our globe indicated that the cooling process must have begun several billion years ago.

Упражнение 4. Выделите в предложениях модальные глаголы и их эквиваленты и переведите их на русский язык.

1. To develop a quantitative approach, all we need is the realization that solubility can be thought of as a special case of chemical equilibrium.
2. Metals are lustrous in appearance, solid at room temperature (with the exception of mercury), good conductors of heat and electricity, malleable (can be hammered flat), and ductile (can be drawn into wire).
3. In cities with heavy automobile traffic, lead concentrations in the atmosphere may be as high as 10 micrograms per cubic meter of air, which endangers the health of countless people.
4. The procedure we have followed can be used to calculate the nuclear binding energy of any nucleus.
5. However, by using a large excess of formic acid in the reaction mixture we can ensure that the concentration of formic acid remains virtually constant throughout the course of the reaction.
6. Because of technical difficulties, scientists have not been able to study the inner portions of Earth as easily as the crust.
7. Because there is a great deal of empty space in a gas, that is, space not occupied by molecules, gases can be readily compressed.

8. Since all meridians and the equator are great circles, the minute scales on these elements of the map may be used to measure lengths.

9. To detect the very weak radio signals a directional antenna and highly sensitive receiver must be used.

10. Using radioactive isotopes, biologists and agriculturalists will be able to carry out research impossible by any other method.

11. We shall have to work out an experiment in which we shall be able to keep the particles in the plasma, that is, deprive them of the possibility of transmitting the heat to the walls of the container.

12. Parts for this submarine could not be ordered; they had to be designed, nothing could be copied from another ship's engine, for this was the first of its type.

13. The wire used should have as large a cross-section as possible when it is desirable to keep resistance as low as possible.

14. Landing lights should be installed on an airplane to provide sufficient illumination in case of forced landing at points other than lighted airports.

15. It is to be noted that the action and reaction as two forces of the pair are called always act on different bodies –never on the same one.

16. Control is furnished by one or more springs and these may also be employed for leading the current in and out of the moving coil.

17. According to the law of conservation of energy, the energy spent in starting the body must be equal to that derived from the body when it is stopped.

18. You ought to know that the term 'equilibrium' applies equally well to a motor car speeding along the straight road at a constant speed of, say, 95 km/hr.

19. With the aid of radar, passenger liners or freighters can navigate accurately and safely through crowded waters at any time.

20. A helicopter is able to rise vertically only because its propeller sets a stream of air into downward motion.

21. The open end of the tube is connected to the apparatus the pressure within which is to be measured.

22. Elastic limit is the point beyond which one should not attempt deforming the body if it is to return to its original condition.

Упражнение 5. Сводное (контрольное). Переведите предложения на русский язык, выделив в них модальные глаголы и их эквиваленты.

1. The first law of thermodynamics describes the conservation of energy; it states that energy can be converted from one form to another, but cannot be created or destroyed.

2. The driver's blood alcohol level can be determined readily by measuring the degree of this color change (read from a calibrated meter on the instrument).

3. Aluminum is the most abundant metal and the third most plentiful element in Earth's crust; it has a low density and high tensile strength: aluminum is malleable, it can be rolled into thin foils, and it is an excellent electrical conductor.

4. However, you should realize that in reality multiple bonds are "larger" than single bonds; that is, because there are two or three bonds between two atoms, the electron density occupies more space.

5. In 1912 the German physicist Max von Laue correctly suggested, that because the wavelength of X-rays is comparable in magnitude to the distances between lattice points in a crystal, the lattice should be able to diffract X-rays.

6. Kinetics usually plays an important role in industrial processes, since the products must be manufactured in the minimum time under the most economical conditions.

7. Until recently, asbestos was used as a thermal insulator in buildings; nowadays it is well established that prolonged exposure to air-borne suspensions of asbestos fiber dust can be very dangerous to the lung tissues and the digestive tract, and often results in cancer.

8. Although many heavy nuclei can be made to undergo fission, only the fission of naturally occurring uranium-235 and of the artificial plutonium-239 has any practical importance.

9. It should be pointed out that the significance of the word 'capacity' in 'heat capacity' is not the same as when one speaks of the 'capacity of a bucket'.

10. Careful attention must be paid to the construction of the diagram and to algebraic signs when using this equation.

11. The energy which has to be supplied by the generator or battery in order to overcome the opposition is transformed into heat within the conductor.

12. The action of the three-electron tube as a detector should be thoroughly understood for this is fundamental in radio.

13. Because of the electrical neutrality requirement the space charge must also remain constant.

14. The point to keep in mind is that a small amount of leakage may occur in some 'intermittent' capacitors even during the periods when the set seems to be operating normally.

15. Water might be used for shielding but concrete, which also contain a good deal of hydrogen, is more convenient.

ГЛАВА 7. ПЕРЕВОД ВИДОВ СОСЛАГАТЕЛЬНОГО НАКЛОНЕНИЯ

1. В английском языке имеются синтаксические структуры в виде предложений, которые выражают реальные и нереальные условия. Такие предложения состоят из придаточной условной части, начинающейся с союза «if», и главной части.

Предложения, которые выражают реальные условия, называются условными и переводятся стандартно с соблюдением значений временных форм, то есть, в условной части всегда будет употребляться время Present Simple, а в главной части предложения Future Simple.

Например: If a solid body is heated, it will usually expand.

Перевод: Если твердое тело нагреть, то оно будет расширяться.

Предложения, которые выражают нереальные условия, стоят в сослагательном наклонении и бывают двух типов:

а) описывают малореальные, но возможные действия, которые относятся к настоящему или будущему периоду времени. В этом случае в придаточном предложении употребляется Past Simple, а в главном - Future-in –the Past. Наряду с глаголами would, should в главной части могут употребляться и другие модальные глаголы can/could, may/might, must. Необходимо помнить, что глагол «to be» в сослагательном наклонении имеет форму «were» для всех лиц.

Например: If the iron core in the centre were soft, the field would be much stronger.

Перевод: Если бы сердечник в центре был мягкий, то поле было бы намного сильнее.

б) описывают абсолютно нереальные, невыполнимые действия, которые относятся к прошедшему периоду времени. В этом случае в придаточном предложении употребляется Past Perfect, а в главном предложении - would, should + Perfect infinitive. Условные предложения такого типа переводятся на русский язык также как и предложения первого типа в сослагательном наклонении с добавлением частицы «бы» в обеих частях предложения.

Например: If you had used a more delicate instrument, you would have recognized smaller magnetic changes at greater distances.

Перевод: Если бы вы использовали более точный прибор, то вы бы распознали небольшие магнитные изменения на большом расстоянии.

в) в условных предложениях этих 2-х типов может применяться инверсия, то есть сказуемое или вспомогательный глагол ставится перед подлежащим. При этом в условной придаточной части отсутствует союз *if*, но при переводе предложения на русский язык союз восстанавливается по смыслу.

Например: Were molecules separated slightly the force between them would be attractive.

Перевод: Если бы молекулы были немного разделены, то между ними возникла бы сила притяжения.

2. Сослагательное наклонение может выражаться глаголом *should* для всех лиц, и инфинитивом в придаточных дополнительных предложениях после глаголов, выражающих намерения и воображаемые действия в будущем, а также в безличных предложениях после союза *that*. Союз принимает на себя сослагательное значение и переводится на русский язык «чтобы», при этом глагол *should* опускается, а инфинитив переводится сказуемым в прошедшем времени.

Например: We recommend that the laboratory tests should be conducted.

Перевод: Мы рекомендуем, чтобы были проведены лабораторные испытания.

Например: It is necessary that the bearing should be made of material having a low coefficient of friction.

Перевод: Необходимо, чтобы подшипник был сделан из материала, имеющего низкий коэффициент трения.

В таких предложениях могут использоваться следующие варианты с тем же значением.

We propose (recommend) that Mr. X.	a) should go	a) should be dismissed
	b) goes	b) is dismissed
	c) go	c) be dismissed
	a) стандартная структура; b) разговорный стиль; c) официальный стиль, особенно АЕ и формы используются для всех лиц.	

3. Сослагательное наклонение употребляется в придаточных обстоятельственных предложениях после большого количества уступительных союзов:

Even if	даже если бы	whenever	когда бы ни
Even though		whatever	какой бы ни
No matter what	что бы ни	wherever	где бы ни
Whoever	кто бы ни	lest	чтобы не

Например: Whatever the nature of the tube be, the emitting electrode must be present.

Перевод: Каким бы ни был тип лампы, необходим излучающий электрод.

4. Сослагательное наклонение употребляется в придаточных обстоятельственных предложениях сравнения или образа действия после союзов as if, as though, которые переводятся на русский язык одинаково: как будто бы.

Например: He listens as if he were greatly interested in our conversation.

Перевод: Он слушает, как будто бы очень заинтересован нашим разговором.

Упражнение 1. Определите форму наклонения в предложениях и переведите их на русский язык.

1. To avoid such confusion, we will adhere to the practice, whenever appropriate, of using the term «atomic hydrogen» for hydrogen atoms,

«molecular hydrogen» for hydrogen molecules, and “the hydrogen element” when we are discussing the properties of the element hydrogen.

2. If we rearrange the ideal gas equation, we can use it to calculate the density of a gas.

3. Consequently, molecules will collide with the walls of the container more frequently and with greater impact if the gas is heated, and thus the pressure increases.

4. If electrons are thought of as spinning on their own axes, as Earth does, their magnetic properties can be accounted for.

5. If we use light of a higher frequency, then the electrons will not only be knocked loose, but they will also acquire some kinetic energy.

6. If the initial kinetic energies are large, then the colliding molecules will vibrate so strongly as to break some of the chemical bonds.

7. However, if the paint is scratched, pitted, or dented to expose even the smallest areas of bare metal, rust will form under the paint layer.

8. If the attraction prevails, the nucleus will be stable.

9. This behavior suggests that if two light nuclei combine or fuse together to form a larger, more stable nucleus, an appreciable amount of energy will be released in the process.

10. If these materials are scarce, the price of the product will be high.

Упражнение 2. Определите форму наклонения в предложениях и переведите их.

1. If an α -particle traveled directly towards a nucleus, it would experience an enormous repulsion that could completely reverse the direction of the moving particle.

2. If we were to carry out this reaction, this would be the equation for us to follow.

3. What would happen if a diver rose to the surface rather quickly without breathing?

4. If we could follow a particular molecule from one side of a room to the other, we would find that its motion is entirely random- its path constantly changing as a result of collisions.

5. If elements were arranged solely according to increasing atomic mass, argon would appear in the position occupied by potassium in our modern periodic table.

6. But of course no chemist would place argon, an inert gas, in the same group as lithium and sodium, two very reactive metals.

7. Since X-rays are one form of electromagnetic radiation, and therefore waves, we would expect them to exhibit such behavior under suitable conditions.

8. If the vapor pressure in the bubble were lower than the external pressure, the bubble would collapse before it could rise.

9. What would happen if the melting and boiling were carried out at some other pressure?

10. If every binary collision led to a product, then most reactions would be complete almost instantaneously.

11. The cooling process removes some of the thermal energy that could otherwise be converted to work and thereby places a limit on the efficiency of heat engines.

12. Hydrogen gas could replace gasoline to power automobiles (after considerable modification of the engine, of course) or be used with oxygen gas in fuel cells to generate electricity.

13. One major advantage of using hydrogen gas in these ways is that the reactions are essentially free of pollutants; the end product formed in a hydrogen- powered engine or in a fuel cell would be water, just as in the burning of hydrogen gas in air.

14. Of course, the potential success of a so- called hydrogen economy would depend on how cheaply we could produce hydrogen gas and how easily we could store it.

15. We would thus expect the protons to repel one another strongly, particularly when we consider how close they must be to each other.

Упражнение 3. Определите форму наклонения в предложениях и переведите их.

1. It would have been impossible to cope with these difficulties, if it had not been for the preliminary work carried out by our scientists, designers and technicians.

2. If the reference level had been taken at some lower elevation such as the floor, the potential energy would have not been zero at the table top.

3. If the reference level had been taken at the ceiling, the potential energy at the table top would have been negative.

4. If Michurin had used only the method of artificial selection, he would not have fulfilled his gigantic task.

5. He might have done the report quite easily, if he had prepared the material beforehand.

6. Had there been no earth's gravitation, the satellites would have moved through airless space in a straight line at a uniform speed.

7. She must have forgotten all about it otherwise she would have come.

8. He would have got all the necessary equipment if he had joined the expedition.

9. Had the checking up of the data not taken so much time, we should have completed our work long ago.

10. It was considered at first that a cubical design of telescope should have been adopted.

11. If the Telstar satellite had been built using the state-of-the-art of a decade ago it would have been a very different satellite.

Упражнение 4. Переведите предложения на русский язык и определите вид сослагательного наклонения.

1. These intermolecular attractions thus tend to pull the molecules into the liquid and cause the surface to behave as if it were tightened like an elastic film.

2. Had you more time at your disposal, we should certainly ask you to take part in the work.

3. If the molecules were perfectly free to move, a very weak magnet would align the molecules as readily as a more powerful magnet.

4. If the earth were a homogeneous sphere, the two magnetic poles would be diametrically opposite each other and all points lying on any great circle passing through both of these poles would have the same magnetic variation.

5. Had you a more delicate instrument than the compass, you could recognize smaller electric or magnetic changes at greater distances.

6. Everyone realizes that the 3-lb weight must be suspended at a greater distance from the pivot than the 4-lb weight and the trial would show that if it were hung at a distance of exactly 4ft from the pivot, the rod would be in equilibrium.

7. It is also very important that the angles and directions measured on the chart should be exactly equal to the corresponding directions that the plane is to follow above the earth's surface.

8. In many operations it is important that the frequency of the oscillator be constant.

9. The limitations of electronic machines demand that the text be reduced to a digestible form before it is fed into the machine.

10. It is practically important that both the electrical fundamentals and the fundamentals of tube operation be understood very thoroughly, otherwise the operation and adjustment of the transmitter will not be clear.

11. Such specialized tubes may usually be analyzed as though they were two or more separate tubes.

12. When turning an aircraft, it is important that the proper angle of bank should be maintained.

13. The sound level of the broadcast programme sent to the transmitter must be carefully adjusted in order to that the carrier be neither over-nor under-modulated.

14. If a relay which has a magnetically controlled switch in the main circuit were located between the battery and the starters, the wire length might be much shorter and the relays themselves would weigh but five pounds or so.

15. This printing technique suggests that a similar method be used in colour television.

16. Whenever a valve be removed from the cylinder, the interior should be thoroughly inspected.

17. Later developments in physics have shown that the electron cannot be accurately considered as if it were in orbital motion about the nucleus.

18. It is necessary that you should know that the selection of the proper metal or alloy for a given use is an important part of the practice of metallurgy.

19. Were there no loss of energy by friction, the motion would continue indefinitely once it had been started.

20. So that an electric current may flow through the circuit it is necessary that there should be an electro-motive force acting in the circuit.

Упражнение 5. Переведите следующие предложения, определяя форму или вид сослагательного наклонения.

1. If the temperature of the cathode is increased, the thermal agitation is increased and the electrons are emitted with a higher average speed.

2. If fifteen volts were placed across the fifteen ohm resistance combination a current of one ampere would flow.

3. Were the load only fifteen amperes there would be available another fifteen ampere for charging the battery.

4. If the core were solid, it would form a closed path of very low electrical resistance so that heavy, parasitic currents, called eddy currents, would be set up in it.

5. He proposed that this fact be used to define a temperature scale which would be independent of the properties of any particular substance.

6. It is theoretically possible that a part of the nuclear energy be liberated by transforming either the lightest or the heaviest of the elements into others of medium weight.

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

8. These experiments show that, when a number of forces are exerted on a body at the same time, each force acts independently of the others and produces the same acceleration as if it alone were present.

9. The altimeter is subject to lag in its movements so that, if machine is rising or falling quickly, the true height will not be indicated.

10. A hot air furnace may be used for heating provided very accurate temperature control is uniformly maintained throughout the furnace by circulated air.

11. If the altimeter of a craft in flight indicates a height of 4,000 feet, the reading will only be correct if the temperature of the air at that height is 50°F.

12. If the earth's mass were twice as great as it is, it would attract the ten-kilogram weight twice as strongly.

13. If sufficient heat is applied over a long enough period of time, the electrons will leave the metal and fly off.

14. A locomotive does work, while pulling a moving train, but, if the brakes of the train became locked so as to prevent motion, no work would be done, no matter how great a force the locomotive were to exert.

15. Let us picture what would happen, if there were a conducting wire between two points of unequal potential.

16. Many measurements which one would expect to be made in grams or in minutes and seconds are actually in centimeters.

17. It is necessary that the heat developed should be used by ducting the hot air either to a heat transfer tank or directly to a gas turbine or ramjet.

18. The work done on the gases by the piston should be subtracted from the work done on the piston by the gases in order to obtain the effective work done by the piston in one complete cycle.

Упражнение 6. Сводное (контрольное). Переведите предложения на русский язык и определите форму наклонения.

1. If we were studying the rusting of iron as a chemistry project, our next step would be to describe this process with a “chemical equation” that tells us how rust is formed from iron, oxygen gas, and water, under a given set of conditions.

2. If the distance between nuclei were to decrease further, the potential energy would rise steeply and finally become positive as a result of the increased electron- electron and nuclear- nuclear repulsions.

3. On the basis of probability consideration, we would expect the gas to fill both flasks spontaneously.

4. Variation of the current within a tube will accomplish no useful result unless this effect is produced in some external load.

5. The expanding gas in the cylinders of an automobile engine does work in pushing against the moving pistons but, if the motion of the pistons were to be prevented in some way, no work would be done by gas in the cylinders no matter how great the pressure is.

6. If the plates are charged plus and minus, the crystal acts as if it were being compressed by a great pressure.

7. Whatever type of service pipe be laid, it should be at a reasonable depth below the surface of the ground, usually not less than 2ft 6 in.

8. In addition and subtraction of decimal fractions the figures must be so placed that the decimal points come under each other; the operation can then be carried out just as if one were dealing with whole numbers.

9. In order to make it easier to understand the way in which the magnetic field changes from point to point, it is convenient that one draw

certain lines which by their direction represent the direction of the magnetic field.

10. If the whole expansion were performed in one cylinder, this cylinder would have to be of sufficient strength to withstand the high initial pressure.

11. If someone weighed 80 kilograms at the North Pole, he would doubtless weigh less at the equator.

12. If the weather conditions were below the minimum allowing the observance of contact, the landing of an airplane would be made at the nearest airport at which the weather conditions are equal to or better than such minimum.

13. Extreme care must be taken were it necessary to remove a valve from a cylinder.

14. If you wanted to proceed in an Easterly direction, and there was a strong Northerly wind blowing, you might have to move off in a northeasterly direction in order to reach your Eastern objective.

15. If a system of forces (including moments or effect of relative position) applied to a body at rest or in uniform motion does not change its position or rate of motion, the system will be in equilibrium.

ГЛАВА 8. ПЕРЕВОД СОСТАВНЫХ СОЮЗОВ И ПРЕДЛОГОВ

Союзы		Предлоги	
Both ... and	как... так и	According to	согласно
Either...or	или...или	In accordance with	в соответствии с
Neither...nor	ни...ни	On account of	по причине
Not only...but	не только...но и	By means of	} посредством
<u>The more the better</u>	<u>чем больше, тем лучше</u>	By virtue of	
As well as	так же как и	Instead of	вместо
As...as	так (же) как (и)	In spite of	несмотря на
As soon as	как только	With respect to	по отношению к
As long as	пока	In case of	в случае
So as	так, чтобы	In addition to	в дополнение к
As to	что касается, относительно	Because of	} из-за
		Owing to	
		Thanks to	
As far as	насколько	Due to	благодаря, из-за, в силу того
For	так как, в виду того, что	Other than	другой кроме...
Since	поскольку, так как, с тех пор	Rather than	а не
In order to	для того, чтобы	Другие служебные слова	
Provided	} если, при условии, если	Thus	таким образом
Providing		However	однако, тем не менее
Supposed		Therefore	следовательно
Supposing		Moreover	более того
		Besides	кроме
		Eventually	в конце концов, в итоге
		Gradually	постепенно
		Yet	к тому же (в начале предложения)
		To any extent	в любой мере, степени

Упражнение 1. Переведите предложения на русский язык, учитывая значения служебных слов.

1. Carburetor icing under certain conditions can occur when the atmosphere temperature is as low as -80° .

2. A compass needle is a piece of magnetized metal (or several pieces fastened together) suspended or floating so as to swing freely.

3. As we have seen already, the altimeter works on the principle of the aneroid barometer.

4. Variations in the pressure of the atmosphere over various parts of the earth's surface give rise to horizontal movements of air as well as to vertical ones.

5. The plate current as it varies induces an electromotive force in the grid cell.

6. As you should know, the light is slowed down as it goes through the lens.

7. As to the electron beam, it is focused somewhat as a beam of light is focused by a lens.

8. The circles drawn around the earth sphere parallel to the equator (parallels of latitude) decrease in size as we go from the equator to either pole.

9. Energy is defined as the ability to do work and it occurs in many forms.

10. As the water is in a state of rest there will be no flow of energy.

11. As long as a steady battery voltage is supplied to the oscillator, the output voltage continuously varies up and down.

12. As the comets recede from the sun again, their brightness rapidly diminishes.

13. This instrument may be used for direct current as well as for alternating current.

14. As this instrument is of the electro-dynamometer type, it is adapted to both direct and alternating currents.

15. As soon as the battery is fully charged, it should be removed from the charger.

16. There are other tubes which have more control grids inserted in the envelope, but these tubes are essentially pentodes, tetrodes or triodes, as far as operation is concerned.

17. The pointer tells how loud the signal is as it is sent to the transmitting station.

18. This motor will supply as much energy as required.

19. If the diaphragm could vibrate at such high frequency and produce corresponding vibrations in the air, the ear could not detect the sound for it would be far above the highest pitch to which the ear is sensitive.

20. From that experiment it is clear that molecular amplifiers will not replace electron tubes in microwave circuits, at least, not for a long time.

21. The flare will burn for approximately 3 minutes and will light up an area of approximately 2 square miles under normal conditions.

22. It is impossible for a pump working in a cycle to transfer water from a lower to a higher level unless external work is done on it.

23. Appliances for converting energy from one form to another are called engines.

24. The smallest electric pressures are sufficient for the electrons to be set in motion.

25. If the cylinder is small the flow of water may be decreased, for the cylinder and piston will have insufficient capacity for high flow.

Упражнение 2. Переведите предложения на русский язык, учитывая значения служебных слов.

1. Under these circumstances, it may be shown that maximum efficiency occurs at the load for which the constant and variable losses are equal.

2. However, for special purposes heat, light and sound are very useful sources of energy as well.

3. For a period of time, the worker will not work in radioactive areas and doctors will make periodic checks of his physical condition to make certain that he is not harbouring radioactive substances in his body.

4. Some of the atoms in your bones are exploding at all times, for minute amounts of phosphorus in your bones are radioactive.

5. At the same time, it is advisable to conduct a thorough study of other roads for the solution of this principal task.

6. It is very difficult to synchronize the engines by ear on some multi-engined aircraft for two reasons: first, the pilot is in position where it is difficult for him to hear the engines clearly.

7. Since a dry cell can generate only direct current we have been considering the flow of electrons in one direction only.

8. Since charges on the grid control the flow of electrons from the filament, we are able to control the flow of the large plate currents by means of a small charge on the grid.

9. We say an object at rest has no kinetic energy, since its velocity is zero.

10. Since the possibility of damage to the long tubes of vapour thermometers exists, electric thermometers or temperature indicators are often used.

11. Since the direction in which a free N pole would move is known as the direction of the magnetic field, the magnitude of the force on unit pole is called the intensity of the magnetic field.

12. We can also picture the flow of alternating current by means of such a graph.

13. In spite of all efforts at improvement, the efficiency of heat engines remains low.

14. According to the law of conservation of energy, the useful work to be done by a machine is less than the total work performed by it.

15. In fact, on account of friction we always get less useful work out of a machine than we put into it.

16. Due to friction part of the energy developed by mechanical devices is lost in the form of useless heat.

17. Owing to the rapidity of the expansion, the steam has no time to condense but remains in an unnatural dry or superheated state.

18. As we know, the steam turbine is mostly used at present instead of the old reciprocating steam engine.

19. One should always remember that lines of force do not really exist and that they by no means indicate a structure of the medium.

20. The resistance due to the landing gear may be reduced by making it partly or wholly retractable.

21. Motion means change of place or position with respect to the position of some other object that we assume as being at rest.

22. Both inductance and capacitance (or capacity) have technical meanings which will be explained in later chapters.

23. The total amount of energy in an isolated system is constant; energy can neither be created nor destroyed although its form can be changed.

24. The more the cathode is heated the more electrons it sends out.

25. When the two field currents are either equal or zero, no torque is produced.

Упражнение 3. Переведите предложения на русский язык, учитывая значения служебных слов.

1. According to Maxwell's theory, an electromagnetic wave has an electric field component and a magnetic field component.

2. The emission spectra of atoms in the gas phase, on the other hand, do not show a continuous spread of wavelength from red to violet; rather, the atoms emit light only at specific wavelengths.

3. The nuclei are repelled by each other's positive charges, rather than held together.

4. Heterogeneous catalysis is by far the most important type of catalysis in industrial processes. It plays an important role in the synthesis of many key chemicals and other chemical processes.

5. This finding is of considerable theoretical interest, for it shows clearly that alkali metals can have an oxidation number of -1, although -1 is not found in ordinary compounds.

6. Sodium ions and potassium ions are present in intracellular and extra-cellular fluids, and they are essential for osmotic balance and enzyme functions.

7. Sodium carbonate is an important compound used in all kinds of industrial processes, including water treatment and the manufacture of soaps, detergents, medicines, and food additives.

8. The alkaline earth metals are somewhat less electropositive and less reactive than the alkali metals.

9. The term «lime» does not refer to a single substance; rather, it includes quick lime, or calcium oxide, and slaked lime, or hydrated lime, which is calcium hydroxide.

10. Unlike that of strontium, barium's toxicity to the human body is chemical rather than radioactive in nature.

11. Rather than trying to devise some type of «absolute» elevation scale (perhaps based on distance from the center of Earth?), by common agreement all geographic heights and depths are expressed relative to sea level, an arbitrary reference with a defined elevation of «zero» meters or feet.

12. Ionic and covalent compounds differ markedly in their general physical properties because of the differences in the nature of their bonds.

13. The direction of the external current flow will have no effect upon this instrument; therefore, it can be used to measure either direct or alternating current.

14. We know that the idea of the electrical nature of lightning greatly interested Lomonosov; he is reported to have made systematic observations and experiments of atmospheric electricity.

15. Thanks to the invention of radio it has become possible to communicate with the remotest parts of the world.

16. That any object will remain motionless or continue to move because of its inertia is a well-known fact.

17. After the angle of attack reached the value at which the lift coefficient is a maximum, the airplane is said to be stalled.

18. Since the type of wing most generally employed in present day aircraft construction is cantilever monoplane, we shall consider that type only and it will be sufficient to enable us to grasp the essential details of wing construction.

19. Owing to the special devices the danger of formation of ice on an aircraft has been reduced still it is a main danger for winter flights.

20. One hundred years ago there were neither electric lamps, nor electric motors, telephone, or radio.

ГЛАВА 9. ПЕРЕВОД МНОГОФУНКЦИОНАЛЬНЫХ ГЛАГОЛОВ

Глагол to have может употребляться в английском предложении в следующих функциях:

1. В качестве вспомогательного глагола для образования форм времен группы Perfect.
2. В качестве модального глагола to have to, выражающего долженствование.
3. В качестве смыслового глагола в значении «иметь» - to have.
4. В составе каузативного оборота в значении «устраивать, делать так».

Упражнение 1. Переведите следующие упражнения и определите функциональное значение глагола to have.

1. All modern direct-current dynamos have more than two poles.
2. A number of ingenious methods have been devised for observing atomic collisions.
3. In actual gas not all atoms have the same speed, some travel more slowly and others more rapidly than the average.
4. After the bullet has come to rest in the block, both block and bullet have the common velocity V .
5. His first published calculations to justify the correctness of his theory had to do with the motion of the moon around the earth.
6. Everyone has at some time blown a soap bubble and, if asked, would undoubtedly reply that in order to increase the size of a bubble, he would have to increase the air pressure within it.
7. Radioactive tracer atoms have become a necessary and effective instrument in investigations in all spheres of science and engineering where various substances have to be detected and then transformations and movements studied.
8. We have seen that a dynamo consists of two essential parts: the field magnet that produces the magnetic field and the armature that carries the conductors, which, by motion in the magnetic field, have e.m.f. induced in them.

9. Current transformers are used wherever high voltage current has to be metered because of the difficulty of providing adequate insulation in the meter itself.

10. During flight the first indication of icing is a loss of power with the loss increasing at a rapid rate and it is possible to have the power seriously affected in less than a minute after the ice accumulation has started.

11. When aircraft are in flight they have of course from time to time to report their position.

12. The earth is supposed to have a shape similar to the shape of a ball.

13. The electron flow will cease when enough electrons have been transferred to bring the free space potentials of the gas atoms and semiconductor surface into coincidence.

14. When a reactor has been working for a while, a part of the U-235 becomes changed into the various fission products.

15. An aircraft at high altitude has a higher ground speed with a given airspeed indication than at sea level.

16. One should know that a surface has two dimensions – length and breadth.

17. Current will pass through a resistor which is in parallel with the condenser but the condenser will have no effect upon this current.

Глагол to be в английском предложении может употребляться в следующих функциях:

1. В качестве вспомогательного глагола участвует в образовании форм группы Continuous.

2. В качестве вспомогательного глагола участвует в образовании форм страдательного залога.

3. В качестве модального глагола to be to, выражающего заранее запланированные действия, которые требуется выполнить.

4. В качестве смыслового глагола в значении «являться, находиться».

Упражнение 1. Переведите следующие предложения и определите функциональное значение глагола to be.

1. The form of energy most required by us is mechanical energy.

2. There are four factors to be considered in the design of this reflector.

3. If a steam turbine drive is to be adopted, higher speeds are essential for the effective design of the turbine.

4. The number of poles and the speed of a.c. generator are largely determined by the characteristics of the prime mover which is to drive.

5. The open end of the tube is connected to the apparatus the pressure within which is to be measured.

6. An electromagnet or temporary magnet is one in which the magnetic field is produced by an electric current.

7. Electrical engineering is a branch of engineering the progress of which has become most manifest during the last century.

8. At the start of the flight while the rocket is moving slowly, the rocket motor is a very inefficient device.

9. The common feature of all types of emission is that the energy is imparted to free electrons in a solid in an amount sufficient to enable them to overcome the restraining forces at its surface and, thus, escape from the solid.

10. When a system of more than one force is to be solved, each force is individually resolved into its component forces.

11. A bullet of mass M whose velocity is to be measured is fired horizontally into the block and remains embedded in it.

12. If the alloy is to be manufactured in wrought forms, the total percentage of alloying elements is seldom more than six or seven per cent, although in casting alloys appreciably higher percentages are frequently used.

13. In aviation, "up gear" is a term commonly used by the crew on a modern transport airplane, while in flight, to indicate that the landing gear is to be or is retracted up into and locked in a compartment provided for that purpose.

14. An atom is composed of a number of electrons which are negative, being grouped around a nucleus which is positive; these electrons are in rapid motion, revolving around the nucleus.

15. While an electron is a very small negative charge of electricity, there are also very small positive charges of electricity which are called protons.

16. It was concluded that the characteristic decay time of the 48 hour effect is not depended on a transport process through the layer.

17. This is obviously an interesting problem to tackle since it should lead to some clarification of the structural details of the surface.

Глагол to do может употребляться в английском предложении в следующих функциях:

1. В качестве смыслового глагола в значении «делать, совершать, выполнять».

2. В качестве вспомогательного глагола для образования вопросительной и отрицательной формы времен группы Simple Tenses.

3. В качестве эмфатического выделения в утвердительных предложениях, которое переводится на русский язык добавлением слов «действительно, именно, все таки» перед смысловым глаголом.

4. В качестве слова-заменителя смыслового глагола во избежание его повторения в английском предложении.

Упражнение 1. Переведите следующие предложения на русский язык и определите функциональное значение глагола to do.

1. In conventional electron tubes the grid and the anode electrode surface become coated with materials evaporated from the cathode, so that they do not exhibit the characteristics of a pure metal.

2. When laying the main service pipe in a city, it is best to do connections late at night to cause a minimum of inconvenience.

3. It does not matter, however, whether the conductors cut the magnetic flux or the magnetic flux cuts the conductors, the action is the same.

4. We do insist on this experiment being made at the earliest possible opportunity.

5. In this position the molecular magnets possess potential energy which they had not before and this came from the work we had to do to turn them.

6. At midnight a thermometer read 1°C and at noon 3°C . How many degrees did the temperature change between midnight and noon?

7. All types of emission are most effective in vacuum. If the emission did occur in the air, the emitted electrons would not get very far through the relatively dense surrounding atmosphere.

8. Westerly winds usually continue to increase in speed with increase in height, while Easterly winds do the opposite, and above 3,000 feet are often replaced by Westerly winds.

9. The statement that coordinates of the stars on the celestial sphere are «fixed» or remain constant is not quite correct, slight changes do occur from time to time.

10. In some of the most important researches in radio astronomy we do not deal with transmission and reception of radio waves but with reception of signals.

11. The amount of work done is measured by the end result and it does not in any way depend upon the time to do the work.

12. Friction between two bodies is called static friction, if slipping force does not occur and kinetic friction, if slipping does occur.

13. Perhaps you are wondering if such an atomic power plant might explode as a bomb does.

14. Equivalent circuits containing parameters that do remain substantially constant are used.

15. The pulsation that does exist is due to the fact that the brush rests on a segment for a short time so that the voltage actually varies slightly between the time that the brush first makes contact to the time that the brush last makes contact.

16. The product of volts and amperes at any instant does give the instantaneous power in watts.

17. The fact that electrons are being emitted does not increase this density because the electrons emitted from the cathode are repelled back to it.

ПЕРЕВОД МНОГОЗНАЧНЫХ СЛОВ

Упражнение 1. Переведите следующие предложения на русский язык, определяя значения многозначных слов по контексту.

1. Mixtures are either homogeneous or heterogeneous.

2. The color, melting point, boiling point, and density of a substance are examples of its physical properties.

3. When subjected to a temperature of about 100°C, the yolk and the egg white undergo reactions that alter not only their physical appearance but their chemical makeup as well.

4. Elements are indicated by symbols that are combinations of letters; the first letter of the symbol for an element is always capitalized, but the second and third letters are never capitalized.

5. Special three-letter element symbols have been proposed for the most recently synthesized elements.

6. The elements can be divided into three categories- metals, nonmetals, and metalloids.

7. The measurements we make are often used in calculations to obtain other related quantities.

8. The meter stick measures length or scale; the buret, the pipet, the graduated cylinder, and the volumetric flask measure volume; the balance measures mass; the thermometer measures temperature.

9. For many years, the units used in science were, in general, metric units, which were developed in France in the 18th century; metric units are related decimally, that is by powers of 10.

10. Three temperature scales are currently in use: their units are K (Kelvin), °C (degree Celsius), and F (degree Fahrenheit); the Celsius scale was formerly called the centigrade scale.

The Fahrenheit scale defines the normal freezing and boiling points of water to be exactly 32°F and 212°F, respectively; it is the most commonly used temperature scale in the United States.

11. Suppose that we are given a certain number and asked to express it in scientific notation. Basically, this amounts to finding n . We count the number of places that the decimal point must be moved to give the number N (which is between 1 and 10). If the decimal point has to be moved to the left, then n is positive integer; if it has to be moved to the right, n is a negative integer. To add or subtract using scientific notation, we first write each quantity with the same exponent n . Then we add or subtract the N parts of the numbers; the exponent parts remain the same. To multiply numbers expressed in scientific notation, we multiply the N parts of the numbers in the usual way, but add the exponents n together. To divide using scientific notation, we divide the N parts of the numbers as usual and subtract the exponents n .

In any compound, the ratio of the numbers of atoms of any two of the elements present is either an integer or a simple fraction.

12. For example, there are three types of hydrogen atoms, which differ only in their number of neutrons: they are hydrogen, with one proton and no neutrons; deuterium, with one proton and one neutron; and tritium, with one proton and two neutrons.

13. A molecule is an aggregate of at least two atoms in a definite arrangement held together by chemical forces.

14. Laser is an acronym for light amplification by stimulated emission of radiation.

15. A number of spectroscopic techniques and X-ray measurements give us bond lengths and bond angles.

16. Ammonia is an extremely valuable inorganic substance used as raw material in the fertilizer industry, the manufacture of explosives, and many other areas.

Упражнение 2. Определите значения терминов по контексту и переведите предложения на русский язык.

1. The word «stress» here means a change in concentration, pressure, volume, or temperature that removes a system from the equilibrium state.

2. Although water undergoes auto-ionization, it is very weak electrolyte and, therefore, a poor electrical conductor.

3. This is the reason that alkali and alkaline earth metal hydroxides are all bases.

4. In section 4.5 we discussed the principle of gravimetric analysis, by which we measure the amount of an ion in an unknown sample.

5. In other words, entropy describes the extent to which atoms, molecules, or ions are distributed in a disorderly fashion in a given region in space.

6. Both diamond and graphite are solids, but diamond has a more ordered structure.

7. The connection between entropy and spontaneity of a reaction is the subject of the second law of thermodynamics.

8. Aside from silver, which is too expensive for large - scale use, copper has the highest electrical conductivity; it is also a good thermal conductor.

9. Both radioactive decay and nuclear transmutation are examples of nuclear reactions; as Table 21.1 shows, nuclear reactions differ from ordinary chemical reactions in several important ways.

10. Chloroform is a volatile, sweet- tasting liquid used for many years as an anesthetic; however, because of its toxicity- it can severely damage the liver, kidneys, and heart- it has been replaced by other compounds.

11. Most synthetic rubbers (called elastomers) are formed from products of the petroleum industry such as ethylene, propylene, and butadiene.

12. The structure of a protein is of great importance, for it is ultimately responsible for the protein's activities: catalytic action, binding of oxygen and other molecules, and so on.

13. Nucleic acids are high molar mass polymers that play an essential role in protein synthesis; there are two types of nucleic acid: deoxyribonucleic acids (DNA) and ribonucleic acid (RNA).

14. The elastic property of rubber is due to the flexibility of the long-chain molecules.

15. The key to the double-helical structure is the formation of hydrogen bonds between bases in the two strands.

16. There are several forms of coal that differ in composition and texture; for example, anthracite coal is the hardest form of coal, while bituminous coal is much softer.

17. Ionic and covalent compounds differ markedly in their general physical properties because of the differences in the nature of their bonds.

ТЕКСТЫ ДЛЯ ПИСЬМЕННОГО / УСТНОГО ПЕРЕВОДА

ТЕКСТ №1 Examples of Applied Chemistry

Potash

Potash is any potassium mineral which is used for its potassium content. It ranked 34th among the top 50 industrial chemicals produced in the United States in 1988 (3.4 billion pounds). About 95 percent of potash is used for fertilizer and the remaining 5 percent is used to make potassium hydroxide, potassium permanganate, and other chemicals which require the potassium atom. Relatively small amounts of potassium chloride are used as a salt substitute in low sodium diets. The major minerals for potash are potassium chloride and potassium sulfate. The three primary methods currently used for the production of potash all involve isolating it from natural deposits. One method extracts potash from surface deposits in salt lakes and other two work on underground deposits either by mining the solid in a fashion similar to coal mining or by dissolving the potassium salts and transporting the solution to the surface for processing. In fertilizer manufacture, the main concern is potassium content, so a company might switch from one mineral to another depending on cost.

Phosphoric Acid

Phosphoric acid is one of the major industrial chemicals produced in the world. It ranked 8th among the top 50 industrial chemicals produced in the United States. The major use of phosphoric acid is in the production of fertilizers since phosphorus is essential for plant growth. Phosphoric acid is also used in detergents and food industry. Polyphosphates made from phosphoric acid are used as 'builders' in detergents to bind calcium and magnesium ions. These metals ions react with soap to form insoluble salts or curds, rendering soap ineffective. However, because of the damaging effects of phosphates to ponds and lakes, the use of phosphate detergent is waning. Phosphoric acid is used in soft drinks to give them the 'tangy' flavor and phosphates are found in products like baking soda. Phosphoric acid is produced principally by two methods: the electric furnace method and the wet process. The acid produced by the furnace method has high purity. The bulk of phosphoric acid (about 90%) used today is produced by the wet process because the cost is lower.

Vinyl chloride

Vinyl chloride is one of the most important commodity chemicals manufactured today. Vinyl chloride is used chiefly to make poly (vinyl chloride or PVC), a plastic that is used in piping, siding, floor tile, clothing, and toys. Vinyl chloride (melting point = -153.8°C and boiling point = -13.4°C) is a colorless gas. It is a recognized carcinogen that is why the recommended limit for vinyl chloride in the air of working places is 5 ppm (parts per million) by volume.

Lime

Lime is a term that includes both calcium oxide (also called quicklime) and calcium hydroxide (also called slaked lime). It ranked 6th among the top 50 industrial chemicals in the U.S.A. in 1988. Lime is one of the oldest chemicals known. It has been used as a building material since 1500 B.C. The largest consumer of lime is the steel industry, which uses the basic properties of lime to remove acidic impurities in iron ores. Lime is also used in air pollution control and water treatment to neutralize acids and to a lesser extent in the food industry. Slaked lime is produced by treating quicklime with water. Quicklime is a white solid that melts at 2570°C . The exothermic reaction of quicklime with water and the rather small specific heats of both quicklime and slaked lime made the storage and transport of the substance hazardous in the old days. Wooden sailing ships would occasionally catch fire when water leaked into the hold containing lime.

Kevlar

The fiber and textile industry has traditionally used many of the natural polymers such as silk, wool, and cotton. Synthetic polymers have been developed that mimic and extend the properties of these natural materials. Since nylon fibers were first synthesized in the 1930s, many synthetic fibers have been reported. Kevlar is one of the newer classes of synthetic fibers. It is heat-resistant and seven times as strong as steel per unit weight. Kevlar is used in belts for automobile tires, ropes, aircraft construction, and lightweight, bulletproof vests. About 45 million pounds of Kevlar were manufactured in the United States in 1988. One feature of Kevlar's structure which is thought to contribute to its unusual strength is the fact that it is quite rigid, this is the long molecules of Kevlar act as rods and do not easily flex or twist.

Silicon

Silicon is the second most abundant element after oxygen in Earth's crust. Its applications range from bulk commodities such as alloys, concretes, and ceramics through more chemically modified systems like glasses and glazes to the recent industries based on silicone polymers. Silicon-based photovoltaic cells can convert solar energy to electricity with efficiency as high as 15 percent. However, its most profound impact on our society is in semiconductors technology. For example, millions of electronic components may be placed on a single chip no larger than the eraser of a pencil - the so-called one-chip computer used in devices such as the pocket calculator. Ultrapure silicon is needed for the electronic industry. Silicon of 99% purity is first made by the reduction of quartz with coke in an electric furnace at about 2000°C. Silicon produced this way, called metallurgical grade (MG) silicon, is used in the metallurgical industry to manufacture corrosion-resistant iron and steel.

Benzene

Benzene is one of the most important organic industrial chemicals. About 90% of benzene is used in the polymer industry. It is also used as a solvent and in the synthesis of compounds. Benzene is a toxic substance and is considered to be a carcinogen. Because of these undesirable properties there is a need to limit its use. However, as a reagent in polymer synthesis, there is no substitute for benzene. Until about the late 1940s the main source of benzene was coal. In recent years benzene is almost exclusively obtained from petroleum in a process called catalytic reforming. This process converts a mixture of hydrocarbons obtained from the distillation of petroleum at 450°, in the presence of a catalyst, to a new hydrocarbon products such as benzene and toluene. Benzene and toluene are called aromatic hydrocarbons because they contain the 'benzene ring'. The reaction mixture is cooled and the condensed liquid is first distilled to remove the volatile components. Further distillation and condensation of the vapor produces a liquid fraction containing about 25% benzene by mass.

Polyethylene

Kinetics usually plays an important role in industrial processes, since the products must be manufactured in the minimum time under the most economical conditions. Consider the synthesis of polyethylene, which is used in many items in everyday life such as piping, bottles, electrical

insulation, toys, and mailer envelopes. Polyethylene is a polymer which is a molecule of very high molar mass (thousands to hundreds of thousands of grams). It is made by joining many units of ethylene molecules, called monomers, together in a process called polymerization.

Citric Acid

Citric acid, present in «citric fruits» such as orange, lemon, and grapefruit, is an important chemical used in the food industry. The addition of citric acid to beverages and fruit juices imparts a sour taste, often imitating the flavor of the fruit for which the beverage is named. The acidic medium also prevents the growth of bacteria and mold. In the pharmaceutical industry the acid, which is solid, is used in effervescent tablets such as Alka-Seltzer.

The Toxicity of Lead

Lead has no known beneficial functions in human metabolism. On the contrary, its toxicity has been known for over 2000 years. Although we know lead is a poison, it is still widely used in our society. At present lead poisoning is one of the most serious environmental concerns. In cities with heavy automobile traffic, lead concentrations in the atmosphere may be as high as 10 micrograms per cubic meter of air, which endangers the health of countless people. In recent years the phasing out of leaded gasoline has helped to reduce the lead content in the environment. Others exposed to lead include young children living in lapidated houses who nibble sweet-tasting chips of leaded paint, whiskey drinkers who consume quantities of lead-contaminated moonshine, and people who eat or drink from improperly lead-glazed earthenware. Soldered joints, which contain lead, in plumbing systems for drinking water are also a major source of lead.

Lead is extremely toxic; its effect on humans is cumulative. It enters the body as inorganic lead ions. Inhaled or ingested lead concentrates in the blood, tissues, and bones. It is known that lead ions inhibit enzymes that catalyze the reactions for biosynthesis of hemoglobin. Thus, one symptom of lead poisoning is anemia. Brain damage is the most common symptom of especially children afflicted with acute lead poisoning. Lead also affects the central nervous system and impairs kidney functions. Lead poisoning is usually treated with chelating agents - substances that can form stable complex ions with lead. Two particularly effective compounds for removing lead ions from blood and tissues are more commonly called BAL (British anti-lewisite). BAL was developed during World War 2 as an

antidote for lewisite, a poison gas containing arsenic. In ionized form, both compounds yield very stable complexes with lead that are eventually excreted through the kidneys.

«Surgeon General's Warning: Smoking is Hazardous
to Your Health»

Warning labels such as this appear on every package of cigarettes sold in the United States. The link between cigarette smoke and cancer has long been established. There is, however, another cancer-causing mechanism in smokers. The culprit in this case is a radioactive environmental pollutant present in the tobacco leaves from which cigarettes are made. The soil in which tobacco is grown is heavily treated with phosphate fertilizers, which are rich in uranium and its decay products.

Consider a particularly important step in the uranium-238 decay series: the product formed, radon-222, is the only gaseous product in the uranium-238 decay series; radon emanates from radium-226 and is present at high concentrations in soil gas and in the surface air layer under vegetation canopy provided by the field of growing tobacco. In this layer some of the daughters of radon-222 such as polonium-218 and lead-214 become firmly attached to the surface and interior of tobacco leaves. The next few decay reactions leading to the formation of lead-210 proceed rapidly. Gradually, the concentration of radioactive lead-210 can build to quite a high level. During combustion of a cigarette, small insoluble smoke particles are inhaled and deposited in the respiratory tract of the smoker and are eventually transported and stored at sites in the liver, spleen, and bone marrow. Measurements have shown that there is a high lead-210 content in these particles. Note that the lead-210 content is not high enough to be hazardous chemically, but because it is radioactive, it is hazardous. Because of its long half-life, lead-210 and its radioactive daughters – bismuth-210 and polonium-210 – can continue to build up in the body throughout the period of smoking. Thus, constant exposure of organs and bone marrow to an A- and B- particle radiation increases the probability of cancer development in the smoker.

The Petroleum Industry

It is estimated that in 2000 about 42% of the energy needs of the United States were supplied by oil or petroleum. The rest was provided approximately by natural gas (23%), coal (24%), hydroelectric power

(3%), nuclear power (7%), and others (1%). In addition to energy, petroleum also supplies numerous organic chemicals used to manufacture drugs, clothing, and many other products.

Petroleum is a complex mixture of alkanes, alkenes, cycloalkanes, and aromatic compounds. Before refining, petroleum is often called crude oil, which is a viscous, dark brown liquid. It is formed in Earth's crust over the course of millions of years by decomposing action of anaerobic bacteria organisms on animal and vegetable matter.

Petroleum deposits are widely distributed throughout the world, mainly in North America, Mexico, western U.S.S.R., the China, Venezuela, and, of course, the Middle East. The actual composition of petroleum varies with location. In the United States, for example, Pennsylvania crude oils are mostly aliphatic hydrocarbons, whereas the major components of western crude oil are aromatic in nature. Although petroleum contains literally thousands of hydrocarbon compounds, we can classify its components according to the range of their boiling points. These hydrocarbons can be separated on the basis of molar mass by fractional distillation. Heating crude oil to about 400°C converts the viscous oil into hot vapor and fluid. In this form it enters the fractionating tower. The vapor rises and condenses on various collecting trays according to the temperatures at which the various components of the vapor liquefy. Some gases are drawn off at the top of the column, and the unvaporized residual oil is collected at the bottom.

Gasoline is probably the best-known component of petroleum. Actually, gasoline is itself a mixture of volatile hydrocarbons. It contains mostly alkanes, cycloalkanes, and a few aromatic hydrocarbons. Some of these compounds are far more suitable for fueling an automobile engine than others, and herein lies the problem of the further treatment and refinement of gasoline. Figure 24.14 shows a schematic diagram of the four-stroke operation of the Otto cycle engine that drives most automobiles. A major engineering concern is to control the burning of the gasoline-air mixture inside each cylinder to obtain a smooth expansion of the gas mixture. If the mixture burns too rapidly, the piston receives a hard jerk rather than a smooth, strong push. This action produces a «knocking» or «pinging» sound, as well as a decrease in efficiency in the conversion of combustion energy to mechanical energy. It turns out that straight-chain hydrocarbons have the greatest tendency to produce knocking, whereas the branched-chain and aromatic hydrocarbons give the desired smooth push.

For this reason, gasolines are usually rated according to the octane number, a measure of their tendency to cause knocking. The higher the octane number of the hydrocarbon, the better its performance in the internal combustion engine.

The octane rating of hydrocarbons can be improved by the addition of small quantities of compounds called anti-knocking agents, this is, tetramethyl lead and tetraethyl lead. The addition of 2 or 4 grams of either of these compounds to a gallon of gasoline increases the octane rating by 10 or more. However, lead is a highly toxic metal, and the constant discharge of automobile exhaust into the atmosphere has become a serious environmental problem. Federal regulations require that all automobiles made after 1974 use «unleaded» gasoline. The catalytic converters with which late-model automobiles are equipped can be «poisoned» by lead, another reason for its exclusion from gasoline. To minimize knocking, unleaded gasoline contains a higher proportion of branched-chain hydrocarbons.

Properties of Polymers

A polymer is a chemical species distinguished by a high molar mass, ranging into thousands and millions of grams. Polymers are often called macromolecules. The physical properties of polymers differ greatly from those of small, ordinary molecules, and special techniques are required to study these giant molecules.

Polymers are divided into two classes: natural and synthetic. Examples of natural polymers are proteins, nucleic acids, cellulose (polysaccharides), and rubber (polyisoprene). Most synthetic polymers are organic compounds. Familiar examples are nylon, Dacron, and Lucite or Plexiglas.

The development of polymer chemistry began in 1920s. Chemists were making great progress in clarifying the chemical structures of various substances, but they were generally puzzled by the behavior of certain materials, including wood, gelatin, cotton, and rubber. For example, when rubber was dissolved in an organic solvent, the solution displayed several unusual properties - high viscosity, low osmotic pressure, and negligible depression in the freezing point of the solvent. These observations strongly suggested the presence of very high molar mass solutes, but chemists were not ready at that time to accept the idea that such giant molecules could exist. Instead, they postulated that materials such as rubber consist of

aggregates of small molecular units, held together by intermolecular forces. This misconception persisted for a number of years, until Hermann Staudinger clearly showed that these so-called aggregates are, in fact, enormously large molecules, each of which containing many thousands of atoms held together by covalent bonds. Once the properties of these macromolecules were understood, the way was open for manufacturing polymers, which play such an important role in almost every aspect of our daily lives. About 90% of current chemists, including biochemists, work with polymers.

Raw Materials for the Chemical Industry

All the chemicals used in industry have to be manufactured from raw materials available in nature. If these materials are scarce, the price of the product will be high. For this reason, major chemical industries have developed around the most plentiful raw materials. The most common raw materials are air, seawater, rock salt, minerals, coal, natural gas, petroleum, and vegetation.

Air. Table 26.1 shows the composition of dry air at sea level; it is the source of six industrial gases such as nitrogen, oxygen, neon, argon, krypton, and xenon. The mass of Earth's atmosphere is approximately 5 to multiply by 10 in 15th power tons; therefore, the supply of the gases is virtually unlimited. The gases are separated from one another by fractional distillation of liquid air. Note that only nitrogen and oxygen are produced on a large scale. The noble gases are used mostly in carrying out chemical research and in providing an inert atmosphere in the recovery of metals and in the electronics.

Seawater and rock salt.

The ocean is an enormous and extremely complex aqueous solution. Seawater is a good source of sodium chloride, magnesium, and bromine. Other elements present in seawater can be more conveniently prepared from their minerals. Sodium chloride is obtained from seawater by evaporation. Another major source of sodium chloride is rock salt.

Minerals. The vast majority of the elements are obtained from Earth's crust. Reactive metals and nonmetals are obtained by chemical or electrolytic reduction and oxidation. Less reactive elements such as platinum, gold, and sulfur occur in the uncombined state. Cheap and abundant minerals such as limestone and dolomite are used in the steel industry, water treatment, paper and pulp industries, agriculture, and many other areas.

Coal. Coal, which is formed by gradual decomposition of plant vegetation over millions of years, is distributed throughout the world. There are several forms of coal that differ in composition and texture; for example, anthracite coal is the hardest form of coal, while bituminous coal is much softer. Coal has served as the main source of solid fuel for thousands of years. Today about 25% of the energy consumption in the United States is supplied by coal. The coal reserve in this country is so large that we can continue using it at the present level for well over another thousand years!

Natural gas and petroleum. Natural gas is a mixture of gaseous hydrocarbons: methane, ethane, and to a lesser extent, propane and butane. It occurs in reservoirs of porous rock (sand or sandstone) capped by impervious strata. Natural gas is often associated with petroleum, with which it has a common origin in the decomposition of organic matter in sedimentary deposits. They are also sources of valuable chemicals for the industry. Figure 26.1 summarizes some of the important uses of compounds obtained from petroleum. Note that in addition to the aliphatic and aromatic hydrocarbons, petroleum contains a sizable amount of inorganic materials, most of which are compounds of nitrogen and sulfur. Natural gas is also a source of sulfur from hydrogen sulfide present in the natural gas and helium.

Vegetation. Many vegetable products are used in the chemical industry. For example, latex is obtained from rubber trees. Natural oils such as castor oil, palm oil, and olive oil are used in the manufacture of soap and margarine. During the processing of sugar cane for the manufacture of sugar, waste syrup (molasses) containing mostly sucrose is treated with enzymes from yeast to give ethanol and carbon dioxide. After World War 2 the manufacture of ethanol was replaced by more efficient synthetic methods. During the oil embargo in the 1970s, attempts were made to use a fuel consisting of 90% gasoline and 10% ethanol to substitute for gasoline. This idea was attractive because the fuel mixture is more efficient and less polluting than the regular gasoline and ethanol could be produced from the fermentation of corn. However, closer study showed that the large-scale production of ethanol was more costly than once thought and the operation would take a substantial portion of the nation's grain crop, thus causing an increase in the price of many foods. Furthermore, since the price of gasoline never rose to the once feared \$2 per gallon level, the idea was largely abandoned. Today ethanol is used in some gasoline to increase its octane number.

The Nature of Nuclear Reactions

Nuclear chemistry is the study of reactions involving changes in atomic nuclei. This branch of chemistry began with the discovery of natural radioactivity by Becquerel and grew as a result of subsequent investigations by Pierre and Marie Curie and many others. Nuclear chemistry is very much in the news today. In addition to applications in the manufacture of atomic bombs, hydrogen bombs, and neutron bombs, even the peaceful use of nuclear energy has become controversial, as evidenced by the accidents at the Three Mile Island and Chernobyl nuclear plants.

With the exception of hydrogen, all the nuclei contain two kinds of fundamental particles, called protons and neutrons. The nucleus itself occupies a very small portion of the total volume of an atom, but it contains most of atom's mass because both the protons and neutrons reside there. In studying the stability of the atomic nucleus, it is helpful to know something about its density, because it tells us how tightly the particles are packed together. Some nuclei are unstable. They emit particles and electromagnetic radiation spontaneously. This phenomenon is known as radioactivity. Nuclei can also undergo change as a result of bombardment by neutrons, electrons, or other nuclei; nuclear changes that are induced in this way are known as nuclear transmutation. Both radioactive decay and nuclear transmutation are examples of nuclear reactions.

The principal factor for determining whether a nucleus is stable is the neutron-proton ratio ($n:p$). For stable atoms of elements of low atomic number, the $n:p$ value is close to 1. As the atomic number increases, the neutron-to-proton ratio becomes greater than 1. This deviation at higher atomic numbers arises because a large number of neutrons is needed to stabilize the nucleus by counteracting the strong repulsion among the protons. A quantitative measure of nuclear stability is the nuclear binding energy, which is the energy required to break up a nucleus into its component protons and neutrons.

Radioactivity is the spontaneous emission by unstable nuclei of particles or electromagnetic radiation or both. The main types of radiation are α -particles, β -particles, γ -rays, which are very short wavelength electromagnetic waves, positron emission, and electron capture. When a radioactive nucleus disintegrates, the products formed may also be unstable and therefore will undergo further disintegration. This process is repeated until a stable product finally formed. Starting with the original radioactive nucleus, the sequence of disintegration steps is called a decay series. It is important to be able to balance the nuclear reaction for each of the steps.

For example, the first step is the decay of uranium-238 to thorium-234, with the emission of an α -particle. In a discussion of radioactive decay steps, the beginning radioactive isotope is called the parent and the product, the daughter.

Aromatic Hydrocarbons

Benzene, the parent compound of this large family of organic substances, was discovered by Michael Faraday in 1826. Over the next 40 years, chemists were preoccupied with determining its molecular structure. Despite the small number of atoms in the molecule, there are quite a few ways to represent the structure of benzene without violating the tetravalency of carbon. However, most proposed structures were rejected because they could not explain the known properties of benzene. Finally, in 1865, August Kekule deduced that benzene molecule could be best represented by a ring structure - a cyclic compound consisting of six carbon atoms.

Benzene is a colorless, flammable liquid obtained chiefly from petroleum and, to a lesser extent, coal tar. Perhaps the most remarkable chemical property of benzene is its relative inertness. Although it has the same empirical formula as acetylene and a higher degree of unsaturation, it is much less reactive than either ethylene or acetylene. We now understand that the stability of benzene is the result of electron delocalization. In fact, benzene can be hydrogenated, but only with difficulty. An enormously large number of compounds can be generated from substances in which benzene rings are fused together. The best known of these compounds is naphthalene, an important component of mothballs. These and many other similar compounds are present in coal tar. Some of the compounds with larger numbers of rings are powerful carcinogens - that is, they can cause cancer in human beings and animals.

The Chemical Industry and the Environment

Nowadays it is difficult to read any newspaper without seeing some account of how one or another type of pollution is plaguing our nation. Many of the environmental problems are directly or indirectly related to the activities of the chemical industry. There are many areas of the chemical industry that must be carefully monitored and controlled to avoid damaging effects on the environment. It is helpful to consider the following categories which contribute to various forms of pollution.

Sources of energy. The chemical industry is energy intensive. Most of the energy is supplied by the combustion of oil and natural gas, and to a lesser extent, coal. Combustion produces carbon dioxide, which contributes to the greenhouse effect, sulfur dioxide, which is responsible for acid rain, and various nitrogen oxides and unreacted hydrocarbons, which result in acid rain and smog formation. It should be pointed out that other industries, automobiles, and domestic use all contribute heavily to various types of air pollution.

Isolation of raw materials. Mining, especially strip mining such as that used for coal and iron, is damaging to the environment, and it may take years for the land to recover and vegetation to grow. Oil drilling on land or beneath the sea is also potentially harmful to the environment. Large-scale oil spills during transportation such as that which occurred in Alaska in 1989 are a major concern and this type of accident cannot be totally prevented.

Chemical processes. During the operation at a chemical plant or during a metallurgical process, harmful gases are often emitted into the atmosphere. For example, roasting of sulfide ores produces sulfur dioxide. In addition, various particulate matters such as soot, ashes, which contain heavy metal salts, and dust are also generated by the plant. For many years the chlor-alkali industry used mercury as the cathode. Although mercury does not participate in the overall reactions, some of it is inevitably discharged with waste solutions into the environment.

Disposal of solid wastes. Most industrial processes result in one or more unwanted by-products which must be discarded. The problem of solid waste disposal (both industrial and domestic) is one of the most serious problems facing our society today. Waste chemicals must be stored in a safe site and constantly monitored. One of the most serious cases of improper disposal of toxic waste was discovered in 1978 when an old chemical dump in Niagara Falls, New York, near Love Canal, began leaking into environment. As a result, the neighborhood had to be evacuated. Much effort is needed to clean up many of the similarly affected landfills in the nation. A related problem is the disposal of nuclear wastes, which does not yet have a totally satisfactory solution.

Potential Hazards of Chemicals

Despite the various environmental problems facing us today, the outlook is not entirely bleak. For the last twenty years or so the chemical industry has become much more aware of pollution control than it once

was. Innovative procedures have been introduced to minimize the damage to the environment. As mentioned earlier, sulfur dioxide generated in metallurgical processes is now used as starting material in the production of sulfuric acid at some plants. Diaphragm cells are replacing mercury cells in the chlor-alkali industry. An intense effort is under way to find replacements for the chlorofluorocarbons (CFC) which will not deplete ozone in the stratosphere. When these compounds were first synthesized as refrigerants, they were considered ideal substances because they are nontoxic and noncombustible. It took nearly thirty years for chemists to realize the potential hazard of CFCs to the ozone in the stratosphere. Slow but promising progress is being made to utilize nonpolluting sources of energy such as solar energy at an economically acceptable level. Scientists are developing bacteria to attack a wide range of toxic wastes. A large-scale experiment is currently in progress to use bacteria to break down the crude oil spilled by oil tankers. In the area of solid waste treatment, recycling offers one of the best solutions. Consider aluminum as an example. Each year Americans throw away enough aluminum to rebuild the entire U.S. commercial airline fleet every three months! Aluminum recycling is economically sound and avoids further damage to the environment from mining. Literally thousands of household articles are made of seemingly indestructible plastic, and they are a main contributor to solid waste and litter on the road. An effective way to reduce the 'plastic' pollution is the manufacture of photodegradable plastics. Light-sensitive compounds are incorporated into the polymer chains that make up the plastic. When exposed to the sun's ultraviolet rays, these compounds become photo-excited and they can cause the polymers to break down into small units.

In recent years the U.S. Congress has enacted a number of important environmental and resource protection laws. The EPA estimates that the total cost of the cleanup may be as high as \$250 billion - an average of \$1000 per person! To be sure, it will take a tremendous effort - both time and money - to clean up our land, water, and air, but this is a small price to pay considering that the future of planet Earth is at stake.

Principles of Automatic Control

The primary object of any automatic device is the removal of the elements of chance and therefore errors which inevitably obtain when a human brain has control, and thus to produce an article more surely, efficiently, and, therefore, more economically. From this hypothesis the

logical components of any automatic control system have been deduced as follows: 1) the ability of the human brain to distinguish large from small, black from white, hot from cold, must be reproduced and heightened such that the device is able to differentiate between 0.0010 in. and 0.0009 in. or between 100 degrees and 99.99; 2) similarly the ability of the human hand must be reproduced such that the device is able to take the course of action dictated by the brain.

These mechanical organs have been termed detector and servomotor and are the basic elements of every control system. Of all detecting devices probably the best known is the temperature detector. One of the simplest of these is the domestic thermostat in which the different coefficients of expansion of two dissimilar metal strips bonded together cause the strips to form an arc when heat is applied, which provides sufficient force to open or close electrical contacts. Electrically, the temperature can be sensed by the change of resistance of a piece of wire. The resistance variations may very simply be transformed to current variations either in a straightforward three-element circuit.

Another electrical detector of temperature changes is the thermocouple. The thermocouple basically consists of two dissimilar metal probes fused together at one end and apart at the other. It was found when heat was applied to the fused end that a very small but easily measurable voltage difference appeared across the free ends of the probes, known as the "cold junction". This voltage increased and decreased proportionally to the temperature difference. The careful selection of metals and increased accuracy of voltage measuring instruments has made it possible to increase the range of the thermocouple to embrace very much lower temperatures.

As every quantity can now be measured and turned into a corresponding electrical signal by a transducer, it can be said that the distinguishing function of the human brain has been reproduced. But since the electrical signal is derived from a sensitive device it can seldom be sufficiently powerful in itself to drive a servomotor that has to do any appreciable amount of work. The signal, then, must be amplified. The word "amplifier" is perhaps slightly misleading since the input signal is not actually amplified but used to control a greater source of power which copies its variations on a larger scale. It is necessary to bear in mind that the amplifier must be provided with energy not only to enable it to do its work, but for it to work.

The Carbon Cycle

The carbon of the planet is found in the atmosphere as carbon dioxide, dissolved in ocean water, bound in biomass, and stored in the lithosphere as carbonate minerals. This substance is a key component in the physics of the planet since it interacts with the heat balance. It is also essential to all living cells as it is used when new biomass is built up in carbon dioxide fixation.

The carbon cycle starts when carbon dioxide in the atmosphere is formed from carbonates in the lithosphere. Carbon has been added to the atmosphere through volcanic activities throughout the history of the planet. An important part of the carbon flow is the formation of calcium carbonate in the seas especially as shells in marine organisms. As these die and their shells sink to the bottom carbonate is transferred from the atmosphere to the sediments which finally become limestone rock, and thus, returned to the lithosphere. This slow, but in the history of the planet, major part of the carbon cycle is estimated to have taken care of some 60 entire atmospheres of carbon dioxide, and that each carbon atom has made some 30 such round trips.

The absorption of carbon dioxide in the ocean water is slow, however, and in addition, limited by the slow mixing of the upper layer with the rest of the oceans. An immediate component is the fixation of carbon dioxide to organic substances by living organisms during photosynthesis. As the biosphere builds up to considerable amounts of biomass, this constitutes a major carbon sink, not the least in the forests of the planet, but also organic material in soil.

Just as carbon dioxide fixation removes carbon from the atmosphere respiration returns it back. In respiration organic molecules are oxidized with oxygen to provide energy for living cells. The by-products are water and carbon dioxide. All kinds of combustion and decay processes add to this flow. The comparatively immense utilization of fossil fuels today seriously disturbs the balance between the natural processes and the modern combustion practices causing the concentrations of carbon dioxide to increase.

Biotechnology

Biotechnology in general refers to the use of living cells or organisms or parts thereof in technical context. In a wider understanding of the concept one might include all domestication of plants and animals. However, classical biotechnology normally includes e.g. use of yeast for fermentation of alcoholic beverages, bacteria for souring wine, milk or

meat, and special enzymes in the production of cheese. All tools - cells, enzymes, etc. - for biotechnology are taken from the environment which again underlines the importance of a protected biodiversity to preserve the potential for finding new interesting genes. An example of a perhaps unexpected such source are the microorganisms from hot springs in volcanic areas, where several enzymes which revolutionized genetic engineering were found. Many medicinally very important pharmaceuticals have been extracted from more or less exotic sources.

Biotechnology usually refers to three different activities: firstly, cultivation of microorganisms or cells in general including mammalian cells; secondly, to the genetic design of such cells, e.g. by the introduction of new genes; and thirdly, to the use of biological macromolecules, especially enzymes, in technical systems. An example is the use of enzyme reactors in chemical procedures, mostly through immobilization of the cells or enzymes to a carrier to allow rational management of the system. Very often all three activities are used in coordinated way to set up a biotechnical production.

Another way to see biotechnology is to refer to controlled biological systems, small ecosystems, which provide special services. A well-known example is the biological step in wastewater treatment. However, much more functions may be developed in special ecosystems, «biological machines». Examples include the extraction of heavy metals - bioextraction of copper is economically as important as mining - precipitation of phosphorus, production of biomass, etc. A rather undeveloped possibility is to let cell cultures, mostly plant cell cultures, produce specific products instead of harvesting these in nature. A glycocorticoid, used as a heart medicine, was extracted from the first such system in large scale production. Other proposed systems may produce also bulk amount of e.g. ginseng and cacao butter. It is difficult to see that such system would be a threat to the environment. Rather it would let some natural resources, now pushed too far, to be less exploited. Assume that you would be able to produce your own cacao in a small cell cultivation in the kitchen corner rather than importing it from a plantation in west Africa, where it is extracted from a small nut on a big tree. The environment impact would clearly be smaller.

The biological machines seem to be the last logical step in a development that started 10,000 years ago in domestication of the living world. The ultimate «biological machine» may be a device that using photosynthetic components, would, from air, water and sunshine, produce a fuel to replace fossil fuels and thus turn the combustion process into a renewable scheme. Such systems are researched today.

РАЗДЕЛ 2. ПЕРЕВОД С РУССКОГО ЯЗЫКА НА АНГЛИЙСКИЙ ЯЗЫК

1. Переведите следующие предложения, учитывая грамматические модели и закрепляя знания общей и специальной терминологии.

1. Смесь водорода и азота применяется при производстве синтетического аммиака.

2. То, что обычное состояние воды - это жидкое состояние, является хорошо известным фактом.

3. То, что мы видим, это совсем на пар, а мельчайшие частицы воды.

4. Воздух вокруг нас всегда находится под давлением.

5. Вопрос в том, что такое дизельный двигатель, как он работает и как отличается от бензинового двигателя.

6. Знаете ли вы принцип действия 4-х тактного двигателя?

7. При нагреве газов мы находим, что они действуют точно таким же образом, как и жидкости.

8. Опыты нам показывают, что между молекулами любого газа существует очень маленькое притяжение.

9. Важной характерной чертой излучения является то, что оно происходит в вакууме.

10. АС и ДС являются сокращениями слов переменный и постоянный ток.

11. Свойства стали зависят от тепловой обработки.

12. Для того, чтобы изучить действие проводников и изоляторов, можно попробовать провести следующий опыт.

13. Основной принцип всех генераторов переменного тока зависит от того, чем вызывается электромагнитная сила.

14. Следующим вопросом является то, как такие ионы взаимодействуют с микроволновой радиацией.

15. Вольтметр - один из самых используемых измерительных приборов, который имеет радиотехника.

16. Коэффициент полезного действия, произведенного двигателем, называется тепловым коэффициентом двигателя (коэффициентом полезного действия).

17. Необходимо учитывать скорость, с которой выполняется работа, также как и общее количество выполненной работы.

18. Мы уже наблюдали много случаев, когда один вид энергии переходил в другой.

19. Радиоактивные изотопы также успешно используются для хранения пищи (продуктов).

20. Сопротивление данного проводника зависит от материала, из которого он сделан.

21. Технические характеристики данной лампы зависят от эффективности, с которой вырабатываются свободные электроны.

22. Электрический ток, проходящий по проводу, будет нагревать этот провод.

23. Электроны, будучи отрицательными, изменяются от более низкого напряжения к более высокому, то есть, от более отрицательных, до менее отрицательных.

24. Все электрические проводники рассеивают тепло при прохождении электрического тока.

25. Каждый элемент существует во множестве вариантов, которые называются изотопами и имеют одинаковый атомный номер, но разный атомный вес.

26. Радиоволны испускаются проводником, по которому проходит ток.

27. При подогреве намагниченная сталь теряет свои магнитные свойства.

28. Электронная лампа - это устройство, состоящее из множества электродов, которые находятся в замкнутом пространстве с разреженным воздухом.

29. Каждая проводящая цепь имеет определенное свойство, называемое электрическим сопротивлением.

30. Мощность измеряется произведением амперов, полученных в цепи, на разницу напряжения в вольтах на концах этой цепи.

31. Когда амперметр или вольтметр подсоединены к цепи, вы можете снимать показания в амперах с первого, и показания в вольтах со второго.

32. Радар применяется для обнаружения местонахождения цели по отношению к установленной (фиксированной) точке на земле.

33. Существует два простых способа измерения угловой скорости.

34. Цепная реакция высвобождает огромное количество гамма-лучей и нейтронов, чье попадание в атмосферу не должно быть допущено.

35. При низких температурах некоторые металлы становятся сверхпроводимыми, имея практически нулевое удельное сопротивление.

36. Несмотря на сжатие, газ возвращается к своему первоначальному объему, как только устраняется прилагаемая сила.

37. Подробное обсуждение термина «работа» является темой следующей статьи.

38. Защита персонала от радиоактивного излучения занимает важное место в работе атомной энергостанции.

39. Мы знаем, что скорость электромагнитных волн изменяется, когда фронт волны пересекает границу между двумя средами.

40. Главной сутью трансформатора является изменение напряжения.

41. Самый простой процесс производства металлических деталей - это такой, при котором расплавленный металл заливают в соответствующие литейные формы или мульды.

42. Кинетические энергии альфа-частиц выводятся из наблюдений за расстоянием, которое они проходят в воздухе.

43. Такое расщепление молекулы водорода сопровождается поглощением огромного количества энергии.

44. Разрыв цепи вызывает исчезновение магнитного поля.

45. Мы знаем, что превращение тепла в химическую энергию обратно пропорционально тому, когда сгорание угля преобразует химическую энергию в тепло.

46. Сжигание топлива является в действительности химическим процессом, так как оно превращает топливо в тепло, свет, газы и пепел.

47. Первым шагом в измерении физической величины состоит в выборе единицы такой величины.

48. Каждая электрическая цепь с проходящим по ней переменным током излучает определенное количество электроэнергии в форме электромагнитных волн.

49. Как нам известно, механическая энергия преобразуется в тепло, причем этот процесс является примером превращения энергии.

50. Жидкости и газы заметно отличаются по своим свойствам сжимаемости, причем газ сжимается легко, в то время как жидкость является практически несжимаемой.

51. Термин «плотность» используется для веса на единицу объема, причем обычной единицей измерения является фунт на фут кубический.

52. Говоря научным языком, энергия – это способность совершать работу.

53. Электрическая дуга применяется для сварки 2-х или больше кусков металла, причем огромное количество тепла выделяется, когда ток проходит от одного электрода к другому в сварочном аппарате.

54. На практике используются различные методы охлаждения трансформаторов, зависящие от размера трансформаторов и местных условий.

55. Скорость охлаждения не важна, хотя быстрое охлаждение может повлиять на гладкую поверхность металла.

56. С передающей антенны радиоволны, передающие радиопрограмму, распространяются во всех направлениях со скоростью света.

57. Существуют разные способы производства высокочастотного тока для подогрева.

58. Железо обладает свойством ограничивать электрическое поле, которое не дает ему рассеиваться на большое расстояние.

59. Для того, чтобы выяснить структуру массы газа, мы должны знать три вещи о нем, а именно: его объем, давление и температуру.

60. Чтобы сравнить источники освещения, необходим обычный источник освещения.

61. Второе условие равновесия - это то, что стремление к вращению должно равняться нулю.

62. Лучший способ понять, что такое электрический ток, это посмотреть как он действует в цепи.

63. Индикатор скорости воздуха используется для измерения скорости самолета в воздухе.

64. Первым шагом к пониманию телевидения является понимание того, как действует катодно-лучевая трубка.

65. Для создания магнитного поля требуется расход определенного количества энергии.

66. Время, которое требуется для поднятия этого груза, не зависит от количества работы, которую следует совершить.

67. Мы знаем, что требуется давления для прохождения воды по трубе.

68. Когда состояние тела таково, что оно может выполнять работу, мы знаем, что тело обладает энергией.

69. Известно, что пар совершенно невидим.

70. Известно, что все металлы состоят из мельчайших частиц, называемых молекулами.

71. Из-за способности притягивать железо, говорят, что эта руда является магнитом.

72. Известно, что солнце представляет собой массу сжатых газов и испарений.

73. Было предположено, что количество протонов является достаточным для подсчета атомного веса.

74. Считается, что некоторые свойства вещества всегда являются неизменными при определенных условиях.

75. Главной причиной использования таких подшипников в станках является уменьшение изнашиваемости и упрощение проблемы смазки.

76. Мы хотим, чтобы вы учли, что напряжение, сопротивление и емкость являются тремя важными свойствами, которые влияют на прохождение тока по цепи.

77. Для того, чтобы прекратить приток воды в данную трубу, вам следует перекрыть вентиль в этой трубе.

78. Известно, что попытки добавлять медь и цинк в сплавы были начала неудачными из-за плохой устойчивости к коррозии металла.

79. Известно, что уран дает альфа, бета и гамма излучения.

80. Естественное стремление теплоты понижаться от высокой температуры к низкой температуре дает возможность паровому двигателю преобразовывать тепло в работу.

81. Известно, что точка плавления льда понижается при применении давления.

82. Чтобы обнаружить очень слабые радиосигналы, должны использоваться высокочувствительный радиоприемник и антенна направленного действия.

83. Известно, что газообразный тяжелый водород используется в таких опытах.

84. Следует отметить, что значение термина «емкость» в слове теплоемкость не является таким же, когда говорят о емкости ведра.

85. Натяжение поверхности может выражаться в единице энергии на единицу площади.

86. Вода, вероятно, будет использоваться для экранирования, но бетон, который также содержит большое количество водорода, более удобен.

87. Из-за требования электронейтральности объемный (пространственный) заряд должен тоже оставаться постоянным.

88. Если твердое тело или жидкость нагревать, то они будут расширяться.

89. Следует учесть, что термин «Ом» нельзя сокращать буквой «О», так как это сокращение всегда берется для нуля.

90. Обнаружено, что для наилучших условий слышимости, время отражения звука должно быть между 1-2 секунды.

91. Теоретически возможно, что часть ядерной энергии могла бы высвободиться путем преобразования самых легких или самых тяжелых элементов в другие элементы средней массы.

92. Электроника - это отрасль техники, прогресс которой наиболее проявился в конце прошлого века.

93. В реальном газе не все атомы имеют одинаковую скорость, некоторые перемещаются медленнее, а другие - быстрее.

94. Атом состоит из множества электронов, которые являются отрицательными и группируются вокруг ядра, которое является положительным; эти электроны быстро двигаются, вращаясь вокруг ядра.

95. Все типы эмиссий являются наиболее эффективными в вакууме. Если эмиссия действительно происходила в воздухе, то выделяемые электроны не смогли бы далеко проходить через относительно плотную окружающую атмосферу.

96. Именно русский инженер Попов изобрел радио.

97. Именно в лаборатории я нашел эти устройства.

98. Полупроводники действительно обладают многими замечательными свойствами.

99. Лишь только после 1950-х ядерная физика стала играть ведущую роль в истории человечества.

100. Именно электрический элемент применяется для преобразования химической энергии в электрическую.

101. Лишь только после проведения многочисленных экспериментов ученые вычислили массу электрона.

102. Сейчас межпланетные полеты действительно становятся реальностью.

103. Именно этот ученый применил это изобретение в этой отрасли науки.

104. В действительности этот поезд никогда не приходит вовремя.

2. Тексты для письменного перевода.

Карта Будущего

Прогресс человечества - штука серьёзная. От того, какие технологии завтра будут определять нашу жизнь, а какие станут не слишком важны или вовсе забыты, зависит в экономике многое, если не всё. Вот и решила молодая американская компания Quid попробовать составить компьютерную карту «генома» технологического прогресса в мировом масштабе.

В течение последних двух лет компания уже собрала информацию для оценки перспектив около 40 тысяч исследовательских групп и фирм, интересы которых напрямую связаны с новейшими технологиями. Сам по себе этот неподъемный пласт информации мало что значит, но в Quid разработали и внедрили компьютерную программу, которая на основании ключевых слов и фраз, извлеченных из миллионов документов: патентов, новостей, веб-сайтов, списков сотрудников, сообщений в блогах и даже объявлений о приеме на работу, - составляет карту. С помощью этой карты уже сейчас можно сделать довольно уверенные предположения о том, какие фирмы и группы могут быть полезны друг другу в ближайшем будущем, на стыке каких наук и областей исследований стоит ждать прорывных открытий и технологий, куда стоит вкладывать деньги, чтобы гарантировано не потерять капиталы.

База данных компании ежедневно пополняется на 120 тысяч документов, совершенствуется программа, разрастается и приобретает новые подробности карта. В своем необычном проекте Quid соединила методы и приемы из разных областей знаний, и можно надеяться, что уже в ближайшем будущем экономистам, инвесторам и финансистам-аналитикам не придется гадать на кофейной гуще, чтобы определить генеральные направления развития науки и техники. Достаточно будет получить доступ к карте Quid. За деньги, разумеется. Не зря же название компании переводится на русский язык как «соверен», «фунт стерлингов» или «кусочек прессованного жевательного табака».

Экологические угрозы

Доминирующая проблема для Беларуси, Украины и России - энергетика. Страны зависят от поставок российского газа и вместе с тем обладают трубопроводами, транспортирующими газ из России в ЕС. Беларусь и Украина, чтобы обеспечить большую энергетическую самостоятельность и безопасность, планируют строить атомные электростанции, несмотря на последствия чернобыльской аварии, которые по-прежнему являются тяжелым бременем для экономик двух стран. Кроме того, быстрое развитие нефтяных терминалов и гидроэлектростанций имеет для стран большое значение не только собственно в энергетическом аспекте, но и в плане безопасности и охраны окружающей среды. В том и государственная задача - спланировать развитие энергетики так, чтобы работать эффективно, не принося ущерба всему живому.

Экологическими проблемами Беларуси занялось международное сообщество. Уже реализуются проекты по конкретным проблемам, актуальным для Беларуси. Они включают вопросы утилизации запасов пестицидов в трансграничных районах, картирование радиоактивного загрязнения и потоков трансураниевых элементов в окрестностях Чернобыльской АЭС. Об этом было заявлено в докладе «Трансформация рисков в сотрудничество», которую подготовила инициатива «Окружающая среда и развитие» (Environment and Security Initiative, ENVISEC).

Эта инициатива была принята на конференции «Окружающая среда для Европы» в Киеве и на Экономическом форуме ОБСЕ в Праге в мае 2003 года. Её цель - сформировать экономическую платформу для долгосрочного решения проблем окружающей среды и безопасности. Все страны-участницы инициативы успешно работают по направлениям инициативы.

Давление газа

В отличие от твёрдых тел и жидкостей, газы поддаются сжатию. Например, весь воздух в вашем доме легко можно сжать, и он поместится в баллон размером меньше ванны. Газы также способны значительно расширяться. Воздух из одного дома, расширившись, может заполнить собой помещение огромного аэровокзала. Причина такой удивительной способности к изменению объёма кроется в наличии пространства между молекулами газа. При сжатии газа они

прижимаются друг к другу, а при расширении, наоборот, отдаляются друг от друга.

Газ как накопитель энергии можно сравнить со сжатой пружиной. Когда происходит сжатие и молекулы газа прижимаются друг к другу, он наполняется энергией и готов вырваться на свободу подобно пружине, которая возвращается в исходное положение. При расширении высвобождается дополнительная энергия: она заключается в давлении, которое представляет собой общий напор всех молекул газа, постоянно сталкивающихся друг с другом. Нагревание газа дает тот же эффект, что и сжатие: высокая температура заставляет молекулы газа двигаться более энергично.

Когда ещё в 17 веке учёные, в частности Роберт Бойль, только начинали постигать природу давления газа, более практичные люди сразу поняли, что его можно использовать в качестве источника энергии. Важным открытием стало то, что воздух, как и все газы, способен оказывать давление благодаря общему напору всех его движущихся молекул. Таким образом, энергия давления газа может быть использована двумя способами - или при снижении давления в ёмкости, когда воздух давит на неё снаружи, или при увеличении давления путем сжатия или нагревания газа.

Давление горячего газа

Принцип работы многих двигателей - изменение давления газа под воздействием тепла. В паровых двигателях сгорающее топливо нагревает воду, превращая её в горячий водяной пар. Этот пар затем подается в камеру, которая называется конденсатором, где быстро охлаждается. По мере того как пар охлаждается, он конденсируется, превращаясь в воду, и его давление резко падает. Пар из конденсатора передаётся по трубам в камеру, находящуюся под поршнем в цилиндре. Когда давление пара снижается, давление воздуха толкает поршень внутри цилиндра, сжимая его всё сильнее и сокращая свободное пространство. Движение поршня заставляет работать механизм двигателя.

В двигателях внутреннего сгорания, которыми оборудовано большинство автомобилей, топливо, как правило, бензин, сгорает непосредственно внутри цилиндра. Сгорая, топливо резко расширяется, многократно увеличивая давления. Оно значительно превышает давление воздуха и с огромной силой толкает поршень. В газовых турбинах, которые устанавливаются на многие

высокоскоростные локомотивы и на большинство кораблей, колёса или винты приводятся в движение вращением турбины. Реактивные двигатели самолётов работают только благодаря давлению газов, выталкиваемых за пределы основной турбины, которая обеспечивает тягу для полета.

Синтетические материалы

Синтетические материалы окружают нас повсюду. Самыми распространенными из них являются пластмассы, которые состоят из очень длинных цепей молекул. Вспомните, сколькими изделиями из пластика вы пользуетесь ежедневно. Не хватит и пальцев обеих рук, чтоб их все перечислить. Одежда тоже может быть сделана из синтетической ткани - на ярлыке можно прочесть её название, например, полиэстер или нейлон.

Пластмассы - это один из основных видов синтетических материалов, основой которых являются высокомолекулярные соединения-полимеры. Молекула полимера или макромолекула представляет собой гигантскую цепь, состоящую из большого числа повторяющихся группировок или звеньев одинакового строения. В зависимости от характера связей между макромолекулами полимеры могут обладать разнообразными свойствами, чем и обусловлено их широкое применение в самых разных областях.

Полимеры могут иметь не только искусственное, но и природное происхождение. Природными полимерами являются кожа, мех, шерсть, шёлк, хлопок. Многие из природных полимеров очень практичны, однако, синтетическим материалам зачастую отдают предпочтение. Пластмассам легче придать любую форму, чем большинству природных полимеров, и они более прочные, легкие и гибкие. Они дольше служат, потому что меньше подвержены разложению.

Первая пластмасса была изобретена в середине 19 века британским металлургом Александром Паркесом, который назвал её паркезином и впервые представил на Всемирной выставке в Лондоне в 1862 году.

Строение полимера

Полимерные молекулы - это длинные цепи, состоящие из множества соединенных между собой маленьких молекул, или мономеров. Например, молекула полиэтилена, из которого делают

пакеты, представляет собой цепочку примерно из 50.000 молекул этилена. Полимеры, содержащие кремний, обладают множеством полезных свойств. Кремний отталкивает воду, не взаимодействует с воздухом и ни с какими другими веществами в организме человека. Этим объясняется тот факт, что соединения кремния применяют для теплоизоляции и производства лаков, а силикон - для производства хирургических имплантов, например, искусственные суставы.

Синтетические материалы широко применяются для изготовления одежды для повседневной жизни и для спорта. Она не мнется, хорошо стирается и быстро сохнет. Например, ткань из полиуретановых нитей - лайкра - хорошо тянется, одежда из неё плотно облекает тело. А такое синтетическое волокно, как кевлар, используют в бронежилетах благодаря его высокой прочности: оно прочнее стали! Одежда велосипедистов от шорт до защитного шлема сделана из синтетических материалов.

Но мы должны помнить о том, что, так как пластмассы не разлагаются также быстро, как природные материалы, пластиковый мусор наносит большой вред животному и растительному миру. Многие виды пластмасс могут подвергаться вторичной переработке, но старайтесь не засорять использованными пластиковыми упаковками и предметами окружающую среду!

Экологическая культура

Вступив в 21 век, человечество столкнулось с целым рядом сложных проблем, обусловленных, с одной стороны, противоречиями между обществом и природой, с другой стороны, политическими, экономическими, культурными противоречиями между экономически развитыми и остальными странами мира. Охрана окружающей среды и рационального использования природных ресурсов представляет собой одну из важнейших функций любого государства и является главным условием обеспечения экологической безопасности, устойчивого экономического и социального развития государства.

Одной из важных задач является дальнейшее развитие конструктивного взаимодействия государственных органов и общественных экологических объединений в решении насущных природоохранных проблем. Остается актуальным доведение экоинформации до широких слоев общественности с использованием возможностей средств массовой информации, а именно, о состоянии окружающей среды, о выбросах загрязняющих веществ в

атмосферный воздух и сбросах в водные объекты химических веществ и их смесей, о внесении химических веществ в почву, что приводит к ухудшению качества или количества подземных вод.

Просвещение населения в области охраны окружающей среды осуществляют Министерство природных ресурсов и охраны окружающей среды и его территориальные органы, органы местного самоуправления, общественные организации, а также учреждения образования, здравоохранения, культуры, организации спорта и туризма. Только объединив усилия всех граждан, можно рассчитывать на реальные успехи в создании благоприятных условий жизни человека, предупредить негативные изменения в природной среде и обеспечить устойчивое развитие.

Деньги на ветер

Знаете ли вы, что германия получает от ветра уже больше 10% процентов своей электроэнергии, и в остальной Европе ветроэнергетика развивается впечатляющими темпами. По данным Всемирной ветроэнергетической ассоциации суммарные мощности ветровой энергетики в 2009 году составили 2% от всей электроэнергии, выработанной в мире. Да этого достаточно, чтобы обеспечить электричеством целую Италию! Лидерами в области приручения стихии ветра, как и следовало ожидать, являются США и Китай. За ними выстроились Германия, Испания, Индия.... В энергетику Дании, например, ветер делает вклад в 20%, в Португалии его энергия составляет в экономике 15%, в Испании - 14%. По данным Всемирной ветроэнергетической ассоциации (WWEA) к 2020 году объем энергии ветра увеличится более чем в 12 раз.

Факт остается фактом: все технологически развитые государства обзаводятся ветряками. Даже небогатая Индия.... Только Россия не владеет ветряными ресурсами. Хотя ещё в 1993 году специальная компетентная комиссия определила, что наши запасы энергии ветра составляют в потенциале 6.218.000.000 мегаватт-часов в год. Это колоссальная цифра! Она означает, что в нашей огромной стране большинство районов перспективны для установки ВЭС. Достаточно заглянуть в недавно изданный «Атлас ветров России». Везде, особенно на севере и востоке нашей страны, ветры имеют среднюю скорость гораздо выше, чем та, что считается минимально пригодной для энергетики.

Во всем мире уже всюду строят энергонакопители. Их принцип действия тот самый, что был изобретен ещё гением Кулибиным в конце 18 века. Этот прашур инерционного аккумулятора устроен примерно также, как и самые современные: пока дует ветер, он не только крутит генератор, но и раскручивает маховик. Когда ветер стихает, огромный маховик продолжает вращать по инерции генератор. Сейчас все страны бьются над созданием конструкции оптимального энергонакопителя - из самых новых материалов, по последнему слову техники.

Сказки озоновой дыры

Наступила зима. А это значит, что снова над Арктикой начала расти озоновая дыра. Прошлой зимой она стала самой большой за всю 20-летнюю историю наблюдений. Чем опасно разрушение озонового слоя над Арктикой?

Зима -2011 дала пищу для размышлений и экологами и метеорологам: за первые три месяца нового года над Антарктикой возникла гигантская озоновая дыра площадью около 2 млн. кв. км, которая очень быстро росла. В итоге на высоте 18-20 километров исчезло более 80% озона!

Ученые тут же забили тревогу: «процесс идет слишком быстро!». Правда, на этот раз климатологи не спешили вставать под зеленые знамена: они признавали, что климатические изменения в сочетании с промышленными выбросами могли повлиять на бурный рост дыры, но вызвать его они были не способны. В чем же причина аномалии? В слишком низкой температуре. Ученые утверждают, что все дело в резком охлаждении стратосферы в сочетании с воздействием солнечного ультрафиолета. Это и привело к дефициту озона.

И вообще - для паники нет оснований: к концу прошлой весны озоновый слой восстановился. Правда, до этого озоновая дыра успела попутешествовать и пройтись не только над Русским Севером, но и даже над Москвой. Она прошла над столицей 3-4 апреля 2011 года. В эти дни солнце было особенно ярким, но никому не пришло и в голову жаловаться на это обстоятельство. По оценкам специалистов, в нашей стране вообще недостаточно ультрафиолетовой радиации, а из-за ее нехватки россияне испытывают дискомфорт. Так что, если озоновая дыра периодически появляется над Россией по весне, то это не так уж и страшно. Главное, чтобы это не стало постоянным

явлением: вот тогда-то солнечная радиация, пробивающаяся сквозь разрывы в озоновом слое, вызовет серьезные изменения в составе атмосферы.

Долой промышленность!

Известный ученый из Института физики атмосферы Николай Еланский убежден, что из-за разрывов в озоновом слое изменяется тепловой баланс, а это сказывается на температурном режиме и на глобальной атмосферной циркуляции. А сбои в глобальной циркуляции могут привести к экстремальным явлениям.

После этих слов сразу хочется примкнуть к зеленым и отправиться закрывать ближайший нефтезавод. Проблема лишь в одном: никто до сих пор не знает однозначно, что именно вызывает разрушение озонового слоя. И нет единого мнения в вопросе о том, насколько виновен человек в появлении озоновых дыр. По идее, производство соединений, приводящих к разрушению озона, следует свести к минимуму, а то и вовсе прекратить. Но это значит - отказаться от целого сектора промышленности, производящего в том числе и товары народного потребления - от дезодорантов и освежителей воздуха до холодильников и самолетов. Потому что и в тех, и в других содержатся фреоны - основные враги озона. Эти соединения хлора способны «жить» в атмосфере от 50 до 1 500 лет.

Однако первые наблюдения за озоновым слоем начались лишь в середине 50-х годов прошлого века. За минувшие годы дыры возникали и затягивались, никакой катастрофы - несмотря на бурный рост промышленности, испытания ядерного оружия и регулярные полеты военных и гражданских самолетов - не произошло. А значит, человеческое влияние на атмосферные процессы, при всей его разрушительности в местном масштабе, в планетарном масштабе ничтожно. Те же извержения вулканов, землетрясения и цунами куда больше сотрясают нашу Землю, и, соответственно, влияют на ее атмосферу. Тем не менее, химическая промышленность остается главной обвиняемой в деле озоновых дыр.

Пять технологий, которые изменят мир

В начале этого года корпорация IBM опубликовала ежегодный аналитический отчет, в котором определяется 5 инновационных технологий, потенциально способных в течение пяти лет всерьез изменить нашу жизнь.

На первом месте стоят технологии, способные значительно улучшить экологическую обстановку на планете. При этом, по мнению специалистов из IBM, люди сами будут выбирать источники энергии и продукты потребления, приносящие минимальный вред окружающей среде. И тем самым примут активное участие в оздоровлении Земли.

На втором месте идут способы управления автотранспортом. Автомобили смогут обмениваться информацией друг с другом, а датчики, встроенные в дорожное полотно, помогут повысить безопасность движения. Специальные системы будут автоматически переключать светофоры и направлять транспортные потоки по запасным маршрутам во избежание пробок.

Также в течение пяти ближайших лет можно будет без проблем получить нужную информацию о любых продуктах питания, что существенно улучшит их качество. А мобильные телефоны превратятся в универсальных личных помощников. При помощи сотового можно будет оплатить покупку в магазине или проезд на транспорте, получить дельный совет при выборе товара. Незаменим будет мобильник и для путешественников: в незнакомом городе подскажет маршрут до нужного пункта и предоставит сведения о местных развлекательных центрах, гостиницах и достопримечательностях.

Наконец, умные головы из IBM полагают, что за пять лет кардинально изменятся способы диагностики организма человека. В первую очередь за счет трехмерного компьютерного моделирования. И жизнь наша станет здоровее и длиннее. Но вот счастливее ли? Но на этот вопрос айбиэмщики, увы, не знают ответа.

Рекламный сюжет «Битумный порошок»

В современных условиях рациональное использование всех материальных ресурсов приобретает особое значение. Компания «Самсонов и Кнудсен» предлагает организациям битумный порошок собственного производства с содержанием битума от 70 до 80%.

Области применения данного материала - разнообразны. Его с успехом применяют в производстве асфальта. Кроме этого активно используют в изоляционных, кровельных и дорожных работах. А также на основе битумного порошка производят кровельные и изоляционные материалы.

В США, например, данный продукт, активно используется для дорожного строительства с 70-ых годов 20 века. В первую очередь битумный порошок применяют для производства асфальтобетонной смеси. Для этого рекомендуется использовать всего до 5 процентов битумного порошка от общей массы смеси.

Со временем даже на хорошем асфальте образуются трещины и ямы. Для проведения ямочного ремонта путем регенерации старого асфальта можно также использоваться наш битумный порошок. Удобство в том, что смесь для такого ремонта готовится непосредственно на ремонтном участке дороги. Старый асфальт нагревают в мобильных установках и туда же добавляют битумный порошок. Достаточно перемешать смесь при определенной температуре и асфальт для дорожных ремонтных работ готов.

Использование данного продукта позволяет производить асфальт, обладающий высокой механической прочностью, особенно при отрицательных температурах. За счет наличия минеральных примесей существенно повышается пластичность трещиностойкость. Асфальт, который произведен с добавлением битумного порошка, имеет практически нулевую водопоглощаемость и водопроницаемость. Для него характерны высокие показатели теплостойкости. Такое дорожное покрытие устойчиво к образованию колеи. Кроме всего прочего, смеси на основе битумного порошка можно применять и зимой на сухих поверхностях.

Все эти факторы заметно повышают качество дорожного строительства.

Кроме этого битумный порошок применяют и для устройства основания дороги. Иными словами подгрунтовки. Порошок наносят прямо на поверхность дороги вручную или же с помощью спецтехники. На один квадратный метр достаточно всего трех килограммов битумного порошка.

Кроме этого данный материал с успехом используется при ремонте мягких кровель по ВИР технологии и проведения изоляционных работ. На его основе производят мастики, праймер, рубероид и другие битумосодержащие материалы.

Битумный порошок является материалом, который по сравнению с традиционным битумом обладает еще одним немаловажным преимуществом. Он фасуется в полипропиленовые мешки или биг-беги и не требует специального транспорта при перевозке.

Битумный порошок с содержанием битума от 70 до 80%, стоит всего 300 долларов за тонну.

Лабораторные и производственные исследования качества нашего битумного порошка проводились белорусским государственным предприятием «Белдор НИИ» и датской компанией «Еврофинс продакт тестинг А/С». Если это необходимо, мы готовы предоставить Вам копии их заключений и аналитических отчетов. Экономьте свои средства и природные ресурсы. Используйте битумный порошок от компании «Самсонов и Кнудсен».

Новый ледниковый период

Часто современное глобальное потепление связывают с ростом солнечной активности. Однако данные астрофизиков убедительно показывают: наше светило относительно стабильно, и нет оснований утверждать, что его стабильность будет нарушена. Разговоры же о том, что активность Солнца опасно возрастает, возникли несколько лет назад из-за ошибочного научного прогноза.

Известно, что активность Солнца циклически меняется на протяжении 10-11 лет. Последний, 23-й (с начала наблюдений) цикл действительно отличался высокой активностью - например, 4 ноября 2003 года была зарегистрирована беспрецедентная по мощности солнечная вспышка (к счастью, выброс случился близко к краю Солнца, и основная масса потоков частиц прошла мимо Земли). Эти наблюдения позволили астрономам говорить о том, что 24-й цикл будет невиданным по интенсивности, тем более, что подобное случалось и прежде, в середине 20 века. Однако, в данном случае астрономы ошиблись. Очередной цикл должен был начаться в феврале 2007 года, однако вместо этого был отмечен продолжительный период солнечного минимума, и новый цикл начался с заметным опозданием - в ноябре 2008 года.

Нечто похожее уже происходило в конце 17 века, что привело не к глобальному потеплению, а, наоборот, к глобальному похолоданию (так называемый Маундеровский минимум). О том, что нас скорее ждет глобальное похолодание, чем потепление, говорят и ученые. К примеру, заведующий сектором космических исследований Солнца Главной астрономической обсерваторией РАН Хабибулло Абдусаматов на основе многолетних наблюдений за Солнцем утверждает, что наша планета уже прошла пик глобального потепления ещё в период с 1998 по 2005 год. Он был обусловлен

главным образом длительным увеличением и необычайно высоким уровнем интенсивности светимости Солнца в течение практически всего 20 века. Сейчас, по мнению ученого, активность светила медленно идет на спад и достигнет своего минимума в 2041 году. Именно это и станет причиной глубокого похолодания на нашей планете, которая уже сейчас начала отдавать тепло. Поскольку тепловая инерция Мирового океана несколько отдалит процесс глубокого остывания Земли, пик глобального похолодания ученый ожидает в 2050-х годах.

Как видите, ответить на вопрос, какие климатические изменения нас ждут, не может даже современная наука. Но ясно одно - природа и человек неоднократно переживали в прошлом сходные катаклизмы. Переживут и следующий, в том случае, конечно, если он случится.

Всемирный потоп

Какую же угрозу несет глобальное потепление? Зеленые полагают, что оно неизбежно вызовет (а то уже вызвало) интенсивное таяние ледников Арктики и Антарктики, что спровоцирует всемирный потоп. Давно подсчитано, что, если все льды на Земле, включая реликтовые, растают, то уровень Мирового океана поднимется на 75 метров. Понятно, что города типа Нью-Йорка, находящиеся в прибрежной зоне, будут затоплены. Но достаточно взглянуть на географическую карту, чтобы убедиться в том, что суши все равно останется более чем достаточно.

Возьмем, например, Россию. При катастрофическом таянии льдов почти вся территория нашей страны останется выше уровня воды, ведь она в основном находится выше 100 метров над уровнем моря. Даже некоторые из наших приморских городов, Сочи или Владивосток уцелеют. В худшем случае затопит Санкт-Петербург, но всегда можно возвести плотину, которая будет защищать город. Ладожское и Онежское озера станут частью Балтики, но море остановится где-то на подступах к Тихвину. Самые большие потери придется на арктические тундры, которые не успеют превратиться в болота, как предсказывают некоторые футурологи, а станут дном нового северного океана.

Однако и такого катастрофического варианта ждать не приходится. В настоящее время отмечено таяние арктических льдов, Но это - плавающие льды. От их таяния уровень воды в Мировом океане не повысится ни на сантиметр. То же самое происходит и в

Антарктике: под воздействием теплых течений тают шельфовые льды, которые являются частью объема Мирового океана и не могут поднять его уровень даже теоретически. Льды, покрывающие континентальную часть Антарктиды, находятся при температурах, которые и в летнее время не поднимаются выше - 27 градусов по Цельсию, а это значит, не могут таять. Кроме того, ледники Антарктики постоянно само - восстанавливаются - общая масса их не менялась на протяжении десятков тысяч лет.

Опасность представляет лишь таяние Гренландского ледового щита. И многолетние наблюдения подтвердили, что такая тенденция существует. Если все льды Гренландии вдруг растают, это может поднять уровень Мирового океана на 7 метров. Однако и такое таяние не произойдет мгновенно, а растянется на целое тысячелетие. Согласно математическим моделям, при запредельно катастрофическом сценарии развития ситуации вода будет прибывать на пару сантиметров в год, что позволит легко приспособиться к изменениям даже обитателям прибрежной зоны. Кстати, человечество помнит период, когда Гренландия была зеленой страной. С точки зрения норманнов, населявших её до начала похолодания в 17 веке, как раз мы, люди 21 века, живем при катастрофической ситуации.

Причуды Гольфстрима

Таяние гренландских льдов может породить ещё одну проблему. Известно, что сравнительно мягкий климат Европы обусловлен благоприятным воздействием мощного атлантического течения Гольфстрим, начинающегося у Багамских островов и несущего экваториальное тепло на северо-восток. Если на широте 60 градусов в Канаде преобладает тундра, в которой пасутся только олени и бизоны, то в Европе на той же широте есть лиственные леса и поля, развито животноводство, а в Шотландии, которая расположена в непосредственной близости от Гольфстрима, растут даже пальмы. Именно тепло Гольфстрима не дает круглый год замерзнуть порту в Мурманске, хотя этот город находится за полярным кругом, - при этом Архангельск, который расположен юго-восточнее, зимой закрыт льдами.

Интенсивное таяние Гренландского ледового щита приведет к тому, что с севера начнут поступать массы холодной пресной воды - она изменит динамику теплообмена, и Гольфстрим отклонится к югу. Соответственно, Европа начнет остывать, что может привести к

резкому похолоданию. Возможно, климат Европы уже начал меняться. Свидетельство тому - необычайно холодные зимы последних лет. Мнения ученых разнятся по поводу скорости процесса: одни считают, что Европа сравняется с Россией по климату уже в 2015 году, другие - что перемены станут ощутимыми лишь через 2-3 десятилетия.

Отметим, что и такое локальное похолодание не выглядит чем-то новым. В начале 14 века Гольфстрим менял направление, после чего в Европе начались сильные дожди и длинные, холодные зимы. В результате несколько лет крестьяне не могли собрать урожай, в Англии, Германии и Северной Франции вымерзли фруктовые сады, и на десятилетие прекратилось производство вин. Прямыми следствиями этих изменений стали массовый голод, кризис феодального хозяйства и крестьянские восстания. Понятно, что в 21 веке столь грозных последствий не будет.

Благодаря новейшим сельскохозяйственным технологиям и налаженным поставкам продовольствия из южных стран, Европа легко преодолевает эпоху климатических перемен, а россияне даже не заметят разницы. Можно встретить утверждения, будто бы Гольфстрим не просто меняет направление, но и останавливается. Причиной называют локальную экологическую катастрофу в Мексиканском заливе, где в апреле 2010 года взорвалась нефтедобывающая платформа, из-за чего в океан попало 5 миллионов баррелей нефти. Однако специалисты уверенно говорят, что такое развитие событий невозможно практически – дело в том, что мощные океанские течения не переносят воду поступательно, как это делает течение реки, - они складываются из движений частиц воды под воздействием кориолисовой силы, возникающей при вращении Земли. Получается, что Гольфстрим будет течь до тех пор, пока наша планета вращается и пока существует Атлантический океан.

Разнообразие животного мира

Животные встречаются практически в каждой точке земли. Некоторые из них добывают пищу в воде, другие питаются растениями или же охотятся на других животных. Биологи подразделяют всех живых существ на большие группы - царства: растения, животные, грибы, бактерии и простейшие. Царства далее делятся на типы. Типы в свою очередь, делятся на классы, классы - на отряды, отряды - на семейства, семейства - на роды, а роды - на

виды. Впрочем, вопрос о правильной классификации не решен - среди специалистов идут горячие споры на эту тему.

Огромное количество многоклеточных живых организмов относится к царству животные. Наука, занимающаяся изучением представителей этого царства, называется зоологией. Животные - сложные организмы, состоящие из множества разнообразных клеток, которые образуют ткани и органы. В отличие от растений животные не могут сами вырабатывать себе пищу - для получения энергии они должны есть. Поэтому у большинства из них имеется пищеварительная система. Также у подавляющей части животных есть нервная система, позволяющая быстро откликаться на изменения внешней среды. Животные сильно отличаются по строению, пищевым привычкам, способу размножения и поведению. Их образ жизни во взрослом состоянии может быть свободным или «сидячим», например, как у кораллового полипа, который находится на одном месте всю свою жизнь. Животные могут жить группами, как муравьи или антилопы гну, или поодиночке, находя партнера только для продолжения рода, как медведи и лоси. Многие животные относятся к беспозвоночным. Это улитки, бабочки, моллюски, иглокожие (морские звёзды и их родичи) и всевозможные черви.

По количеству видов и распространенности самая процветающая группа живых организмов - это тип членистоногие. Он включает в себя ракообразных, паукообразных, многоножек, а также самый большой класс насекомых. Сейчас описано около 1,5 миллиона видов насекомых, но, возможно, ещё большее число видов пока не открыто. Обитающие во всех морях и океанах мира, медузы являются самыми древними в мире животными; они существуют на Земле сотни миллионов лет. Медузы похожи на простую желеобразную массу, но на самом деле удивительно интересно устроены. У кубомедуз, например, очень сложная нервная система. Многие медузы светятся в темноте.

Биоразнообразие (биологическое разнообразие) - это разнообразие жизни во всех её проявлениях. Под биоразнообразием понимают разнообразие на трех уровнях организации жизни: генетическое (разнообразие генов и их вариантов), разнообразие видов в экосистемах и, наконец, разнообразие самих экосистем.

Есть ли жизнь на Марсе?

Космический корабль, больше напоминающий летающую тарелку, 6 августа этого года рано утром благополучно опустился на Марс. Семь минут космический аппарат проходил атмосферу Красной планеты и операция, на которую специалисты возлагали огромные надежды, успешно завершилась. Цель полета - изучение химического и минералогического состава марсианской почвы, для этого корабль снабдили специальной дрелью, которая позволит ему бурить поверхность Красной планеты для добычи образцов. В идеале ученые надеются обнаружить признаки жизни - существующей или хотя бы некогда существовавшей. Конечно же, рассчитывать на обнаружение на Марсе разумных существ не приходится, но какие-то формы жизни там, вероятно, можно отыскать.

Ученые считают, что когда-то климат на Красной планете был довольно благоприятным для развития жизни. Скорее всего, там было тепло и влажно. По крайней мере, на это указывают углубления в марсианской поверхности, в которых, как предполагается, плескались моря-океаны. Однако два миллиарда лет назад погода на Марсе сильно испортилась: стало сухо, ветрено и холодно. Что же так сильно повлияло на марсианский климат? Почему некогда глубокие моря и реки высохли? Эти вопросы пока остаются без ответа.

Экваториальный кратер Гейла, на который слетел робот, считается самым подходящим для этого местом. Не исключено, что когда-то там плескалось море или озеро, поэтому большим везением будет, если корабль найдет в кратере воду. А если он обнаружит там ещё и следы органической жизни, то это станет грандиозной сенсацией. Необходимое оборудование на борту имеется: десять научных приборов, включая российский нейтронный детектор, предназначенный для поиска скрытой под слоем почвы воды.

Почему ученых так волнует прошлое Марса? Потому что от этого зависит, как ни странно, будущее Земли. Если на Красной планете была жизнь, там должно остаться много чего полезного. Запасы ископаемых на нашей планете не безграничны, и когда они закончатся, мы сможем получить их с соседних планет. По прогнозам ученых, на Марсе могут быть запасы железа, меди, серы, фосфора. Есть вероятность, что они встречаются там в виде минеральных скоплений, поскольку эволюция гидрологических и вулканических процессов на Марсе, по-видимому, аналогична земной. Марсианская атмосфера и лёд, залегающий под поверхностью, очевидно, содержат

углерод, азот, водород и кислород. В тамошних кратерах отчетливо видны слои отложений, которые вряд ли могли сформироваться без участия воды. Такие же слоистые структуры горной породы широко распространены и на земле в тех местах, где имело место отложение осадков в водоёмах. Около две трети поверхности Марса представляет собой горную местность с большим количеством кратеров, возникших от ударов метеоритов и окруженных обломками твёрдых пород. Вблизи экватора расположены 4 вулкана, каждый из которых просто гигант в сравнении с любым земным. Самый грандиозный из них - гора Олимп - возвышается над окружающей местностью на 27 километров. Вблизи вулканов змеится обширная система каньонов длиной около четверти экватора. Словом, надо только поискать, и обязательно что-нибудь отыщется.

Приложения в помощь переводчику

1. Словообразование

а) словообразование путем конверсии.

При конверсии от существительного, реже от прилагательного, без изменения его графической и звуковой формы образуется новое слово, относящееся к другой части речи:

Land - to land, result - to result, place - to place, light - to light - light (прил.), face - to face. Remember! Use - use, house - house (чередование звуков).

б) образование слов при помощи чередования ударения.

При помощи ударения различаются по значению такие части речи, как существительные и глаголы: `conduct - con`duct, `content - con`tent, `detail - de`tail, `export - ex`port, `import - im`port, `present - pre`sent, `protest - pro`test, `record - re`cord, `subject - sub`ject, `transfer - trans`fer, `transport - trans`port.

в) аффиксация, то есть, образование новых слов путем прибавления к корневым словам префиксов и суффиксов, широко применяется в английском языке. Запомнить значения префиксов и суффиксов английского языка будет легче, если анализировать слова, связанные общим корнем.

Например, глагол to react - reactor, reaction, reactivity, reactance, reactive, reacting.

Наиболее употребительные префиксы английского языка:

Co-operate - сотрудничать, ex-pose - выставлять, extra-ordinary - чрезвычайный, in-lay - вставлять, multi-stage - многоступенчатый, out-grow - перерастать, over-come - преодолеть, poly-technical - политехнический, post-war - послевоенный, pre-determine - предопределять, pro-claim - провозглашать, sub-tropical - субтропический, super-heat - перегрев, trans-formation - преобразование, ultra-violet - ультрафиолетовый, under-ground - подземный, under-estimate - недооценивать.

Префиксы отрицательного значения употребляются для выражения противоположного действия или значения, а также для отрицания обозначаемого качества:

Anti-war - антивоенный, counter-act - противодействовать, counter-weight - противовес, de-scent - спускаться, de-water - обезвоживать, dis-advantage - недостаток, dis-appear - исчезать, dis-approve - не одобрять, dis-load - разгружать, in-accuracy - неточность, in-definitely - неопределенный, in-frequent - редкий, im-possible - невозможный, im-polite - невежливый, il-legal - незаконный, il-literate - неграмотный, ir-regular - нерегулярный, non-ferrous - цветной, un-necessary - ненужный, un-equal - неравномерный.

г) образование существительных от глаголов с помощью суффиксации:

Driver - водитель, operator - оператор, assistant - помощник, construction - строительство, movement - движение, pressure - давление, passage - проход, difference - различие, performance - исполнение, being - существо.

Образование существительных от прилагательных:

Socialism, safety, activity, happiness, frequency, freedom.

Образование прилагательных с помощью суффиксации:

Active - деятельный, reliable - надежный, dependent - зависимый, pleasant - приятный, bluish - синеватый, roomy - просторный, industrial - промышленный, electrical - электрический, dangerous - опасный, careful - тщательный, careless - неосторожный, soundproof - звуконепроницаемый, molecular - молекулярный, elementary - элементарный.

Суффикс -less по своему значению противоположен суффиксу -ful и соответствует приставкам русского языка без-, не-: endless - бесконечный, wireless - беспроводной. Иногда слова с этими суффиксами необходимо переводить описательно, согласно нормам русского языка: eventful - полный событий, eventless - бедный событиями, friendless - не имеет друзей, без друзей.

2. «Ложные друзья переводчика»

(слова, которые являются заимствованными в русском языке, но их непосредственный перевод на русский язык созвучным словом будет приводить к искажению смысла оригинала при переводе)

Accurate (accuracy)	- точный (точность)	Pretend	- притворяться
Active (activity)	- деятельный (деятельность)	Principal	- главный, основной
Actual	- действующий, фактический	Production	производство
Audience	- публика	Product	- продукция
Authority	- власть, полномочия	Prospect	- перспектива
Brilliant	- блестящий	Subject	- тема, предмет
Control	- управлять	Realize	- осознавать, понимать
Contribution (but indemnities)	– вклад	Utilize	- применять, использовать
Delicate	- точный (о приборах)		
General	- общий, основной		
Instance	- пример		
List	- перечень, список		
Limit	- предел, граница		
Magazine	- журнал		
Manufacture	- производить		
Natural	- природный, естественный		
Object	- предмет		
Original	- первоначальный, подлинный		
Person (personal)	- личный, индивидуальный		
Public	- общественный		

3. Латинские и греческие заимствования (Latin and Greek Borrowings)

	Форма ед. числа (Sing.)	Форма мн. числа (PL.)
Axis	(ось, луч)	axes
Basis	(основа, основание)	bases
Crisis	(кризис)	crises
Diagnosis	(диагноз)	diagnoses
Hypothesis	(гипотеза)	hypotheses
Oasis	(оазис)	oases
Parenthesis	(вводное слово, скобка)	parentheses
Synopsis	(краткий доклад)	synopses
Thesis	(диссертация)	theses
Bacillus	(микроб)	bacilli
Cactus	(кактус)	cacti
Fungus	(гриб, грибок)	fungi
Genius	(гений)	geniuses
Nucleus	(ядро)	nuclei
Radius	(радиус)	radii
Stimulus	(импульс, толчок)	stimuli
Terminus	(конечный пункт)	termini
Genus	(род, ген)	genera
Corpus	(тело, устав)	corpora
Amoeba	(амеба)	amoebae
Antenna	(антенна)	antennae
Formula	(формула)	formulae (but formulas)
Agendum	(повестка собрания)	agenda
Bacterium	(бактерия)	bacteria
Curriculum	(распорядок дня, план)	curricula
Datum	(данное, сведение)	data
Forum	(собрание, съезд)	fora
Medium	(среда, середина)	media
Memorandum	(памятка)	memoranda (memos)
Stratum	(слой)	strata
Criterion	(критерий)	criteria
Phenomenon	(явление)	phenomena

4. Система работы с лексикой (синонимы - антонимы)

Aim (цель)	- purpose, objective
Speed (скорость)	- velocity, rate, rapidity
Big (большой)	- large, huge, vast, enormous, immense, tremendous
Main (главный)	- principal, major, chief
Basic (основной)	- fundamental, essential
Constant (постоянный)	- permanent
Well-known (известный)	- notable, remarkable, distinguished, outstanding
Important (важный)	- significant
Full (полный, целый)	- whole, entire, total
To use (использовать)	- to apply, to employ, to utilize
To get (получать)	- to achieve, obtain, gain, receive
To equip (оборудовать)	- to fix, to install, to mount
To provide (обеспечивать)	- to supply
To show (показывать)	- to demonstrate, to reveal, to illustrate, to point out
To work (работать, совершать работу)	- to operate, to accomplish, to fulfill
To define (определять)	- to determine, to indicate, to identify
To include (состоять)	- to consist of, contain, comprise, compose, involve
To produce (производить)	- to manufacture
To increase	- rise, raise, enhance
To decrease	- reduce, diminish, slow down
To continue	- go on
To stop	- finish, cease.

5. Как правильно читать дроби по-английски

$1/3$ - (a) one third, but $1/2$ - a half, $1/4$ - a quarter.

$2/3$ ton - two thirds of a ton.

3.04 - three point nought four.

0.25 - nought point two five (= nought point twenty-five), or point two five (= point twenty-five).

0 = zero (the U.S.).

$2/3$ kilometre - two thirds of a kilometer.

0.25 ton - nought point two five of a ton.

24 $1/8$ tons - twenty-four and one eights tons.

12.75 tons - one two (= twelve) point seven five tons.

2% - two per cent.

In telephone numbers: 5-22-07 - five double two o [ou] seven.

6. План краткого пересказа любого текста (How to render a text)

Types of texts: article, essay, leaflet, booklet, paper (chapter), advertisement, survey, controversy, public opinion poll, briefs, summary, synopsis.

1. The title of the text

The title of the text is... . The text under the title... presents the survey of current economic problems.

2. The introduction of the topic (the subject-matter, the issue, the message) of the text

The text deals with... /touches upon.../focuses on... sheds light on....

The text is devoted to.../narrates about.../covers... .

The text presents the survey of.../the argumentation in favour of (against).../provides a deep analysis of... .

The main purpose of the text is the analysis of... /the description of.../the explanation of... .

This chapter is on.../is about... .

3. The major points of the content

The author describes.../gives a description of.../provides a detailed description.../represents.../depicts.../provides a thorough review of... .

The author classifies.../clarifies.../covers the following points.../underlines that.../assumes that... .

The author singles out.../confirms.../explains.../illustrates.../ emphasizes the idea of.../opposes the idea of.../reveals.../ reflects.../ points out.../draws the reader's attention to... /puts forward the idea of... .

The author casts light upon confirms.../keeps to the requirement.../makes a contraposition of... /investigates... .

Attention is drawn to the fact that... . In the opinion of the author it is... . Of special interest is his argument that

The work consists of ...chapters/parts.... The work comprises.../contains... /includes... . The work is supplemented with... .

4. The conclusion of the text

The author comes to the conclusion that.../states that.../gives an account of.../draws the following conclusion... /proves the idea of.../approves that... .

The basic approach of the author is... . Particular attention is paid to.../is focused on... .

The author concludes by saying that.../doesn't agree with.../opposes the idea of... /underlines the (un)importance /the (in) significance) of....

The work is of interest to.../is of particular interest to.../is intended for ...

5. Introductory words and word combinations to do logical connection within a sentence

According to, in accordance with, on this account, in addition to, apart from, alongside with, as a result of, as a whole, in respect to, as compared with, at least, on this basis, combined with, in combination with, corresponding to, as concerns, without going into details, by contrast, considering all that, summing it up, to sum it up, in other words, in brief, finally, however, moreover, thus, in fact, therefore, yet, namely.

It should be added that.../mentioned that.../ universally acknowledged that....

It is clear/evident/obvious that... . There can be no doubt that... . It goes without saying that....

СОДЕРЖАНИЕ

Предисловие.....	3
РАЗДЕЛ 1. ПЕРЕВОД С АНГЛИЙСКОГО НА РУССКИЙ ЯЗЫК	
ГЛАВА 1. СТРУКТУРА АНГЛИЙСКОГО ПРЕДЛОЖЕНИЯ. ВИДЫ ПРИДВТОЧНОГО ПОДЧИНЕНИЯ.....	5
ГЛАВА 2. ПЕРЕВОД ВРЕМЕННЫХ КОНСТРУКЦИЙ В ДЕЙСТВИТЕЛЬНОМ И СТРАДАТЕЛЬНОМ ЗАЛОГЕ...26	
ГЛАВА 3. ПЕРЕВОД ПРИЧАСТИЙ И ПРИЧАСТНЫХ ОБОРОТОВ.....	38
ГЛАВА 4. ПЕРЕВОД ГЕРУНДИАЛЬНЫХ ОБОРОТОВ.....	50
ГЛАВА 5. ПЕРЕВОД ИНФИНИТИВНЫХ ОБОРОТОВ И КОНСТРУКЦИЙ.....	66
ГЛАВА 6. ПЕРЕВОД МОДАЛЬНЫХ ГЛАГОЛОВ И ИХ ЭКВИВАЛЕНТОВ.....	86
ГЛАВА 7. ПЕРЕВОД ВИДОВ СОСЛАГАТЕЛЬНОГО НАКЛОНЕНИЯ.....	95
ГЛАВА 8. ПЕРЕВОД СОСТАВНЫХ СОЮЗОВ И ПРЕДЛОГОВ.....	105
ГЛАВА 9. ПЕРЕВОД МНОГОФУНКЦИОНАЛЬНЫХ ГЛАГОЛОВ.....	111
ТЕКСТЫ ДЛЯ ПИСЬМЕННОГО/УСТНОГО ПЕРЕВОДА.....	119
РАЗДЕЛ 2. ПЕРЕВОД С РУССКОГО ЯЗЫКА НА АНГЛИЙСКИЙ ЯЗЫК.....	135
Приложения в помощь переводчику.....	158

Литвинко Ольга Всеволодовна

**ПИСЬМЕННЫЙ ПЕРЕВОД
(АНГЛИЙСКИЙ ЯЗЫК)**

Пособие

**для слушателей специальности 1-21 06 74
«Современный иностранный язык (английский)»
вечерней формы обучения**

Подписано в печать 20.01.15.

Формат 60x84/16. Бумага офсетная. Гарнитура «Таймс».

Ризография. Усл. печ. л. 9,76. Уч.-изд. л. 10,31.

Изд. № 28.

<http://www.gstu.by>

Отпечатано на цифровом дуплекаторе
с макета оригинала авторского для внутреннего использования.

Учреждение образования «Гомельский государственный
технический университет имени П. О. Сухого».

246746, г. Гомель, пр. Октября, 48