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АНГЛИЙСКИЙ ЯЗЫК

УЧЕБНО-МЕТОДИЧЕСКОЕ ПОСОБИЕ ДЛЯ СТУДЕНТОВ ХИМИЧЕСКИХ СПЕЦИАЛЬНОСТЕЙ ЗАОЧНОЙ ФОРМЫ ОБУЧЕНИЯ

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Учебно-методическое пособие предназначено для студентов химических специальностей заочной формы обучения. Оно способствует формированию знаний, умений и навыков, необходимых для выполнения просмотрового чтения, анализа и перевода аутентичных текстов по специальности на первой ступени высшего образования. Данное пособие содержит текстовый материал из оригинальной научно-технической литературы и практические задания. Пособие может использоваться как в аудиторной работе, так и для организации самостоятельной работы.

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ПРЕДИСЛОВИЕ

Учебно-методическое пособие предназначено для студентов химических специальностей заочной формы обучения. Оно поможет сформировать знания, умения и навыки, необходимые для выполнения просмотрового чтения, анализа и перевода аутентичных текстов по специальности на первой ступени высшего образования. Данное пособие включает текстовый материал из оригинальной научно-технической литературы и практические задания.

Данное пособие состоит из трех основных модулей: «Модуль 1. Тексты и упражнения на 1-й семестр», «Модуль 2. Тексты и упражнения на 2-й семестр», «Модуль 3. Тексты и упражнения на 3-й семестр», и модуля итогового контроля. В каждый из трех первых модулей входят по пять разделов, содержащих словарь, 1 текст и блок из 9 упражнений к нему для повторения и закрепления грамматических навыков. Чтобы их выполнить, необходимо освоить и повторить следующий грамматический материал:

– модуль 1: to be, to have; nouns; pronouns; adjectives (positive, comparative, superlative; degrees of comparison);

– модуль 2: modal verbs and their equivalents, tenses, types of questions, passive voice;

– модуль 3: the verbals (Infinitive, Gerund, and Participle) forms, functions, and constructions.

В последний, четвертый, модуль вошли 5 дополнительных текстов по химии и грамматический тест для итогового контроля.

Пособие может использоваться как в аудиторной работе, так и для организации самостоятельной работы.

TEXTS AND EXERCISES FOR THE 1ST TERM

1.1. THE PERIODIC TABLE

Ex. 1. Read and learn the following words.

To arrange – располагать; to assist – способствовать; certain – некоторый, определенный; closely – тесно, близко; common – простой; concept – концепция, понятие; to indicate – указывать; to predict – предсказывать; to relate – связывать; to suggest – предполагать.

Ex. 2. Read and translate the text.

The Periodic Table of D.I. Mendeleyev

There are certain natural groupings among the chemical elements in which every element is closely related to the other elements in its group. In order to understand better these groupings, chemists have tried to fit the elements into a single plan. One of the earlier attempts to fit the relationships among the elements into a single law was made by John Newlands in England, who suggested the Law of Octaves. This concept of the periodic repetition of properties was further developed by a Russian chemist Dmitri Mendeleyev who created a Periodic Table in which he arranged the elements according to their atomic weights and corresponding chemical properties.

D.I. Mendeleyev, an outstanding Russian scientist, was born in Tobolsk in 1834. In 1850 at the age of 16 he entered the Pedagogical Institute in Petersburg to study chemistry. Five years later he graduated from it with a gold medal and was invited to lecture on theoretical and organic chemistry at Petersburg University.

To continue his studies and research Mendeleyev was sent to Germany in 1859. While living abroad he made a number of important investigations. The year 1868 was the beginning of his highly important work "Fundamentals of Chemistry". When working at the subject Mendeleyev analyzed an enormous amount of literature, made thousands of experiments and calculations. This tremendous work resulted in the Table of Elements consisting of vertical groups and horizontal periods.

Mendeleyev was the first to suggest a system of classification in which the elements are arranged in the order of increasing atomic weights.

D.I. Mendeleyev listed the elements known at the time (1869) in the order of their atomic weights from the lightest to the heaviest. The elements were arranged in a table of eight columns; elements having similar properties appeared in the same columns or groups in the table. Mendeleyev even predicted that there were undiscovered elements and left empty spaces in this table for the new discoveries.

There are many ways the Periodic Table can be used. The table can be used to find the atomic number. The atomic weight is also indicated in the table. The orbital arrangement of electrons is shown for each of the elements. The common oxidation states are given. For most elements these numbers are the same as the valence numbers. The table enables us to recognize families of elements. For example, copper (29), silver (47), and gold (79) will all be found in the same column. They have similar properties and are considered a chemical family. And at last the table can be used to predict the properties of the elements. The fact that the Periodic Table can assist in predicting properties of elements has helped in the discovery of missing elements.

The main idea of the Periodic System is the idea of periodic repetition of properties with the increase of the atomic weights. Arranging all the existing elements in the Table Mendeleyev had to overcome great difficulties, as a considerable number of elements were unknown at that time and the atomic weights of 9 elements (out of 63) were wrongly determined.

Thanks to his investigations Mendeleyev was able to predict not only the existence of a few unknown elements but their properties as well. Later these elements were discovered.

D.I. Mendeleyev was engaged not only in the study of chemistry. Combining theory with practical activity he carried out enormous research in coal, petroleum, iron and steel industries in Russian.

Mendeleyev died in 1907 at the age of 73. The achievements in chemistry and physics at the end of the 19^{th} and at the beginning of the 20^{th} century made it necessary to reconstruct the Periodic Table taking into account new discoveries. This progress resulted in the discovery of the inert gases and the study of 14 rare earth elements.

In the last few decades 11 new radioactive elements were obtained. Two of them were named in honour of Russian scientists: the 101^{st} was called Mendeleyevium and 104^{th} – Kurchatovium (in memory of

Igor Kurchatov). After more than 100 years of its existence, the Periodic Law has preserved its full value.

Ex. 3. Answer the questions.

1. What certain natural groupings are there among the chemical elements? 2. What have chemists tried to do in order to understand better these groupings? 3. Who made one of the first attempts to fit the relationships among the elements? 4. Who developed the concept of the periodic repetition of properties? 5. What columns are there in Periodic Table? 6. What did Mendeleyev predict? 7. What are the ways the Periodic Table can be used? 8. When was D.I. Mendeleyev born? 9. Where did he study chemistry? 10. What is his greatest discovery?

Ex. 4. Identify an odd word.

1. Kurchatov – Lebedev – Glazunov – Mendeleyev. 2. Glass – stones – plastics – drugs – metals. 3. Colour – smell – solubility – density – toxicity. 4. Carbon – Copper – Oxygen – Nitrogen – Sulphur.

Ex. 5. Match the words with their definitions.

1) substance	a) a liquid mixture
2) chemistry	b) a substance diffused in the air
3) vapor	c) the science that deals with the compositions and properties of substances
4) solution	
5) matter	d) a particular kind of matter with uniform properties
6) atom	e) the basic unit of a chemical element
7) molecule	f) physical substance
	g) a group of atoms bonded together

Ex. 6. Prove whether the following statements are true or false.

1. D.I. Mendeleyev, an outstanding Russian scientist, was born in Tomsk in 1834. 2. While living abroad he made a number of important investigations. 3. D.I. Mendeleyev was engaged only in the study of chemistry. 4. The elements were arranged in a table of seven columns. 5. The table enables us to recognize families of elements. 6. Mendeleyev was the third to suggest a system of classification. 7. There are certain natural groupings among the chemical elements in which every element is closely related to the other elements in its group.

Ex. 7. Complete the sentences with the words from the table below.

predicted, experiments, classification, suggested, discoveries, horizontal, investigations, properties, arranged

1. Thanks to his investigations Mendeleyev was able to predict not only the existence of a few unknown elements but their … as well. 2. Mendeleyev was the first to suggest a system of … in which the elements are … in the order of increasing atomic weights. 3. When working at the subject Mendeleyev analyzed an enormous amount of literature, made thousands of … and calculations. 4. Mendeleyev even … that there were undiscovered elements and left empty spaces in this table for the new … . 5. One of the earlier attempts to fit the relationships among the elements into a single law was made by John Newlands in England, who … the Law of Octaves. 6. This tremendous work resulted in the Table of Elements consisting of vertical groups and … periods. 7. While living abroad D.I. Mendeleyev made a number of important … .

Ex. 8. Complete each sentence using a word derivationally related to the word given in brackets.

1. This concept of the periodic (to repeat) of properties was further developed by a Russian chemist Dmitri Mendeleyev. 2. The orbital (arrange) of electrons is shown for each of the elements. 3. There are certain (nature) groupings among the chemical elements. 4. A (chemistry) change involves changes in composition and in properties. 5. Compounds are (to combine) of elements. 6. The (to achieve) in chemistry made it necessary to reconstruct the Periodic Table taking into account new discoveries. 7. Thanks to his investigations Mendeleyev was able to predict not only the (to exist) of a few unknown elements but their properties as well.

Ex. 9. Put the words in the right order.

1. arranged / of / the / were / columns / elements / in / a / table / of / eight. 2. Tobolsk / in / D.I. Mendeleyev / was / in / 1834 / born. 3. weights / elements / of / arranged / atomic / in / the / order / of / are / increasing. 4. classification / to / Mendeleyev / the / suggest / a / was / system / of / first. 5. properties / the / of / table / the / elements / predict / can / be / used / to / the. 6. D.I. Mendeleyev / Petersburg / 1850 / to / entered / the / Pedagogical / in / Institute / in / to / study / chemistry. 7. calculations / made / of / experiments / and / D.I. Mendeleyev / thousands.

Ex. 10. Say it in English.

Установить связь, пустое пространство, расположение электронов на орбите, недостающие элементы, позволяет нам распознать, преодолеть трудности, повторяемость свойств, огромное количество, тесно связан, степень окисления.

Ex. 11. Complete the sentences using the information from the text.

1. D.I. Mendeleyev listed the elements known at the time (1869) in the order of their atomic weights from the lightest to the … . 2. The fact that the Periodic Table can assist in predicting properties of elements has helped in the … . 3. This concept of the periodic repetition of properties was further developed by … . 4. The elements were arranged in a table of … . 5. One of the earlier attempts to fit the relationships among the elements into a single law was made by John Newlands in England, who suggested … . 6. The table can be used to find … . 7. The year 1868 was the beginning of his highly important work … .

1.2. COMPOSITION OF SUBSTANCES

Ex. 1. Read and learn the following words.

Absorption – поглощение; compound – соединение; to consist – состоять; to compose – составлять; to contain – содержать; constituent – составная часть; to divide – делить; to distribute – распределять; to decompose – разлагать на составные части; definite – определенный; to define – определять; to distinguish – различать.

Ex. 2. Read and translate the text.

Composition of Substances

Chemistry is an experimental and theoretical study of the composition of matter and changes that take place in matter. A chemical change involves changes in composition and in properties. A physical change involves only changes in properties with no change in composition. Chemical changes are usually accompanied by the liberation or the absorption of energy in the form of light, heat or electricity. Matter exists in three states: the solid, the liquid and the gaseous state. A substance can be transformed from one state to another under the changes of its temperature. Every substance has physical and chemical properties. Physical properties include color, smell, solubility, density, hardness and boiling and melting points. Chemical properties include the behavior with other materials.

All substances consist of molecules. Molecules are the smallest particles of a substance which retain its chemical properties. The molecules of one and the same substance are identical, while the molecules

of different substances differ in weight, size and other properties. Every substance exists as long as its molecules are intact.

The molecules of substances consist of still smaller particles called atoms. Atoms are chemically indivisible particles that make up molecules. Each different type of atoms is called a chemical element, that is, the term "element" is used to denote a substance which can't be decomposed into simpler substances. Oxygen, hydrogen, sulphur, others are liquids, e.g. mercury; still others are gases, e.g. hydrogen, oxygen.

The distribution of chemical elements in nature is very unequal. Oxygen is the most widely distributed element on our planet. Most of it is in chemical combination with other elements. Silicon is the second most abundant element. The six most common metals are aluminum, iron, calcium, sodium potassium, and magnesium. These eight elements make up about 98 % of our planet.

Chemical elements are not many. After many years of experiments and tests scientists have found only 107 elements. In contrast, there are several hundred thousands of compounds which can be decomposed into elements.

Compounds are characterized in the following way. 1. A compound always consists of two or more different elements. 2. The composition of any given compound is always perfectly definite. For example, iron sulphide Fe_2S_3 contains iron and sulphur in the proportion of seven parts by weight of iron to four of sulphur. 3. The chemical energy of a compound is always different from the sum of chemical energies of its constituents taken separately. 4. A compound has its own characteristic properties which differ in many respects from the properties of its constituents.

The third class of substances is very large. It includes different mixtures. In the structure of a mixture we can distinguish several substances. Ordinary concrete is an example of a mixture. In a broken piece of concrete it is easy to distinguish crushed stone, sand, and cement. In many cases, however, mixtures and compounds are not so easily distinguished.

Ex. 3. Answer the questions.

1. What is chemistry? 2. What does a chemical change involve? 3. What does a physical change involve? 4. What particles do all substances consist of? 5. What is a molecule? 6. How do molecules differ? 7. What does the term element denote? 8. In what states can elements exist? 9. What are the most abundant elements? 10. What do you know about the third class of substances?

Ex. 4. Identify an odd word.

1. Compound, link, conjunction, decay, combination. 2. Weight, property, characteristic, feature, quality. 3. Solid, hard, firm, strong, mild. 4. Drug, medicine, silicon, preparation, cure.

Ex. 5. Match the words with their definitions.

1) matter	a) the degree of compactness of a substance
2) solid	b) being the same in quantity, size, degree or value
3) compound	c) firm and stable in shape
4) mixture	d) a particular kind of matter with uniform properties
5) density	e) physical substance in general
6) substance	f) a thing that is composed of two or more elements
7) equal	g) a substance made by mixing other substances together

Ex. 6. Prove whether the following statements are true or false.

1. All substances consist of molecules. 2. A physical change involves only changes in composition. 3. Silicon is the most widely distributed element on our planet. 4. A chemical change involves changes in composition and in properties. 5. Physical properties include color, smell, solubility, density. 6. Chemical properties include the behavior with other materials. 7. Molecules are the smallest particles of a substance which retain its chemical properties.

Ex. 7. Complete the sentences with the words from the table below.

experimental, matter, properties, compounds, three, elements, water, distribution

1. … are combinations of elements. 2. A compound always consists of two or more different … . 3. Every substance has physical and chemical … . 4. Ice changes into … . 5. The … of chemical elements in nature is very unequal. 6. Chemistry is an … and theoretical study of the composition of matter and changes that take place in matter. 7. Matter exists in … states. 8. Changes in … that produce new substances are called chemical changes.

Ex. 8. Complete each sentence using a word derivationally related to the word given in brackets.

1. (Chemistry) changes are usually accompanied by the liberation or the (to absorb) of energy in the form of light, heat or electricity. 2. Chemistry is an (experiment) and theoretical study of the composition of matter and changes that take place in matter. 3. Most of it is in

chemical (to combine) with other elements. 4. The (to distribute) of chemical elements in nature is very unequal. 5. The molecules of one and the same substance are identical, while the molecules of (to differ) substances differ in weight, size and other properties. 6. Oxygen is the most (wide) distributed element on our planet. 7. The (to form) of compound from simpler substances is known as synthesis.

Ex. 9. Put the words in the right order.

1. molecules / that / consist / of / particles / atoms / are / indivisible / chemically. 2. particles / molecules / are / the / of / a / substance / smallest. 3. the / distributed / widely / elements / most / are / oxygen / nature / silicon / and / in. 4. elements / scientists / only / have / 107 / found. 5. chemical / has / every / substance / properties / physical / and. 6. consist / all / molecules / substances / of. 7. as / every / exists / molecules / as / long / its / are / intact / substance.

Ex. 10. Say it in English.

Состав веществ, жидкие и твердые вещества, данное соединение, сохранять химический состав, идентичные молекулы, твердое состояние, химическое превращение, иметь место, точка кипения, точка плавления, чистое вещество, газообразное состояние, процесс разложения, взрывчатое вещество, плотность.

Ex. 11. Complete the sentences using the information from the text.

1. The molecules of substances consist of still smaller particles called … . 2. The molecules of one and the same substance are identical, while the molecules of different substances differ in weight, size and … . 3. Chemical changes are usually accompanied by the liberation or the absorption of energy in the form of light, heat or … . 4. The six most common metals are aluminum, iron, calcium … . 5. A compound has its own characteristic properties which differ in many respects from the properties of … . 6. The composition of any given compound is always … . 7. Matter exists in three states: the solid, the liquid and … .

1.3. CARBOHYDRATES

Ex. 1. Read and learn the following words.

Bond – связь; blood – кровь; to contain – содержать; cell – клетка; cellulose – целлюлоза; diffusion – диффузия; digestion – пищеварение; fuel – топливо; hydrolysis – гидролиз; insoluble – нерастворимый;

paramount – первостепенный; to produce – производить; to reduce – снижать, восстанавливать; to require – требовать; substance – вещество; source – источник; starch – крахмал.

Ex. 2. Read and translate the text.

Carbohydrates

Carbohydrates are substances of paramount importance biochemically and are widespread naturally. Carbohydrates (also called saccharides) are molecular compounds made from just three elements: carbon, hydrogen and oxygen. Monosaccharides (e.g. glucose) and disaccharides (e.g. sucrose) are relatively small molecules. They are often called sugars. Other carbohydrate molecules are very large (polysaccharides such as starch and cellulose).

Carbohydrates are: 1) a source of energy for the body e.g. glucose and a store of energy, e.g. starch in plants; 2) building blocks for polysaccharides (giant carbohydrates), e.g. cellulose in plants and glycogen in the human body; and 3) components of other molecules e. g. DNA, RNA, glycolipids, glycoproteins.

Monosaccharides are the simplest carbohydrates and are often called single sugars. They are the building blocks from which all bigger carbohydrates are made. Monosaccharides have the general molecular formula (CH_2O), where n can be 3, 5 or 6. They can be classified according to the number of carbon atoms in a molecule:

$n = 3$ – trioses, e.g. glyceraldehyde;

$n = 5$ – pentoses, e.g. ribose and deoxyribose ("pent" indicates 5);

$n = 6$ – hexoses, e.g. fructose, glucose and galactose ("hex" indicates 6).

There is more than one molecule with the molecular formula $C_5H_{10}O_5$ and more than one with the molecular formula $C_6H_{12}O_6$. Molecules that have the same molecular formula but different structural formulae are called structural isomers.

Pentoses and hexoses can exist in two forms: cyclic and non-cyclic. In the non-cyclic form their structural formulae show they contain either an aldehyde group or a ketone group. Monosaccharides containing the aldehyde group are classified as aldoses, and those with a ketone group are classified as ketoses. Aldoses are reducing sugars; ketoses are non-reducing sugars. This is important in understanding the reaction of sugars with Benedict's reagent. However, in water pentoses and hexoses exist mainly in the cyclic form, and it is in this form that they combine to form larger saccharide molecules.

Glucose is the most important carbohydrate fuel in human cells. Its concentration in the blood is about 1 gdm^{-3}. The small size and solubility in water of glucose molecules allows them to pass through the cell membrane into the cell. There are two forms of the cyclic glucose molecule: α-glucose and β-glucose. Two glucose molecules react to form the dissacharide maltose. Starch and cellulose are polysaccharides made up of glucose units.

Galactose molecules look very similar to glucose molecules. They can also exist in α and β forms.

Fructose, glucose and galactose are all hexoses. However, whereas glucose and galactose are aldoses (reducing sugars), fructose is a ketose (a non-reducing sugar). It also has a five-atom ring rather than a six-atom ring. Fructose reacts with glucose to make the dissacharide sucrose.

Ribose and deoxyribose are pentoses. The ribose unit forms part of a nucleotide of RNA. The deoxyribose unit forms part of the nucleotide of DNA. Monosaccharides are rare in nature. Most sugars found in nature are *disaccharides*. These form when two monosaccharides react. A condensation reaction takes place releasing water. This process requires energy. A glycosidic bond forms and holds the two monosaccharide units together. The three most important disaccharides are sucrose, lactose and maltose. They are formed from the a forms of the appropriate monosaccharides. Sucrose is a non-reducing sugar. Lactose and maltose are reducing sugars.

Disaccharides are soluble in water, but they are too big to pass through the cell membrane by diffusion. They are broken down in the small intestine during digestion to give the smaller monosaccharides that pass into the blood and through cell membranes into cells.

Monosaccharides are used very quickly by cells. However, a cell may not need all the energy immediately and it may need to store it. Monosaccharides are converted into disaccharides in the cell by condensation reactions. Further condensation reactions result in the formation of polysaccharides. These are giant molecules which, importantly, are too big to escape from the cell. These are broken down by hydrolysis into monosaccharides when energy is needed by the cell.

Starch is often produced in plants as a way of storing energy. It exists in two forms: amylose and amylopectin. Both are made from α-glucose. Amylose is an unbranched polymer of α-glucose. The molecules coil into a helical structure. It forms a colloidal suspension in hot water. Amylopectin is a branched polymer of α-glucose. It is completely insoluble in water.

Glycogen is amylopectin with very short distances between the branching side-chains. Starch from plants is hydrolyzed in the body to produce glucose. Glucose passes into the cell and is used in metabolism. Inside the cell, glucose can be polymerized to make glycogen which acts as a carbohydrate energy store.

Cellulose is a third polymer made from glucose. But this time it's made from β-glucose molecules and the polymer molecules are "straight". Cellulose serves a very different purpose in nature to starch and glycogen. It makes up the cell walls in plant cells. Cellulose is not hydrolysed easily and, therefore, cannot be digested so it is not a source of energy for humans. The stomachs of Herbivores contain a specific enzyme called cellulose which enables them to digest cellulose.

Ex. 3. Answer the questions.

1. What are carbohydrates? 2. What functions do carbohydrates perform? 3. What are structural isomers? 4. What is the general formula of carbohydrates? 5. What are the products of hydrolysis of lactose? 6. Which is the most important carbohydrate fuel in human cells? 7. What are often called sugars? 8. What is the type of reaction that occurs when a disaccharide is formed from two monosaccharides? 9. In what forms can pentoses and hexoses exist? 10. What is the natural source of carbohydrates?

Ex. 4. Identify an odd word.

1. Carbon – nitrogen – hydrogen – oxygen. 2. Condensation – addition – reduction – hydrolysis – recycling. 3. Ribose – fructose – glucose – galactose. 4. Lactose – sucrose – starch – maltose.

Ex. 5. Match the words with their definitions.

1) fuel	a) a sweet white or brown substance that is obtained from plants and used to make food and drinks sweet
2) starch	b) is a polymeric molecule implicated in various biological roles in coding, decoding, regulation, and expression of genes
3) DNA	c) the process of breathing
4) sugar	d) a polymeric carbohydrate consisting of a large number of glucose units joined by glycosidic bonds
5) respiration	e) a substance that carries genetic information in the cells of the body
6) RNA	f) a substance such as coal, gas, or oil that can be burned to produce heat or energy

Ex. 6. Prove whether the following statements are true or false.

1. Carbohydrates are molecular compounds made from just four elements. 2. Monosaccharides and disaccharides are often called sugars. 3. Fructose reacts with glucose to make the dissacharide lactose. 4. Lactose and sucrose are reducing sugars. 5. Monosaccharides containing the aldehyde group are classified as ketoses. 6. The most important carbohydrate fuel in human cells releases energy when the molecules are metabolized. 7. Monosaccharides have the general molecular formula $C_n(H_2O)_n$ where *n* can be 3, 5 or 6.

Ex. 7. Complete the sentences with the words from the table below.

ketoses, maltose, cells, substances, plants, glucose, disaccharides

1. Monosaccharides and … are relatively small molecules. 2. Carbohydrates are … of paramount importance biochemically and are widespread naturally. 3. Glucose is the most important carbohydrate fuel in human … . 4. Fructose, … and galactose are all hexoses. 5. Aldoses are reducing sugars; … are non-reducing sugars. 6. Starch is often produced in … as a way of storing energy. 7. The three most important disaccharides are sucrose, lactose and … .

Ex. 8. Complete each sentence using a word derivationally related to the word given in brackets.

1. Molecules that have the same molecular formula but different (structure) formulae are called structural isomers. 2. A condensation (to react) takes place releasing water. 3. The small size and (soluble) in water of glucose molecules allows them to pass through the cell membrane into the cell. 4. Monosaccharides are used very (quick) by cells. 5. Cellulose is a (three) polymer made from glucose. 6. Sugar and starch play a major role in (nutrient). 7. The stomachs of Herbivores contain a (to specify) enzyme called cellulose which enables them to digest cellulose.

Ex. 9. Put the words in the right order.

1. cells / very / monosaccharides / are /quickly / by / used. 2. are / sugars / lactose / maltose / reducing / and. 3. made / glucose / third / cellulose / is / polymer / a / made / from. 4. nature / most / in / found / disaccharides / are / sugars. 5. an / amylase / α-glucose / is / unbranched / of / polymer. 6. glucose / made / starch / and / cellulose / are / of / polysaccharides / up / units. 7. make / fructose / with / to / the / reacts / dissacharide / glucose / sucrose. 8. human / carbohydrate / glucose / is / the / cells / most / fuel / in / important.

Ex. 10. Say it in English.

Самый важный природный дисахарид, продукт конденсации, основной источник энергии, крахмал, соединение углерода и воды, смесь глюкозы и фруктозы, число атомов углерода, растворимый в воде, взаимодействие между молекулами, сложное явление.

Ex. 11. Complete the sentences using the information from the text.

1. Monosaccharides are converted into disaccharides in the cell by … . 2. Glucose passes into the cell and is used in … . 3. Disaccharides are soluble in water, but they are too big to pass through the cell membrane by … . 4. The ribose unit forms part of a nucleotide of … . 5. Fructose reacts with glucose to make … . 6. This is important in understanding the reaction of sugars with … . 7. Galactose molecules look very similar to … .

1.4. FATS

Ex. 1. Read and learn the following words.

Acids – кислоты; compound – соединение; to conduct – проводить; density – плотность; insoluble – нерастворимый; liquids – жидкость; mixtures – смеси; oxygen – кислород; rancidification – прогорклость; solids – твердые вещества; source – источник.

Ex. 2. Read and translate the text.

Fats

Fat is one of the three main types of nutrient. Fats are found in many foods. They are made of macromolecules called lipids. Lipids are based on long-chain fatty acids. Some of these are essential because the body cannot make them. Fats occur naturally in food and play a significant role in human nutrition. Fats are used to store energy in the body, insulate body tissues, cushion internal organs, and transport fat-soluble vitamins in the blood. Fats also play in an important role in food preparation: they enhance food flavor and food texture, make baked products tender, and conduct heat during cooking.

Fats are the most prevalent class of compounds (in living systems) referred to as lipids. Lipids are cellular compounds that are insoluble in water. Fats are soft, low-melting solids, with a density less than that of

water. They have a greasy feel and are slippery. Because fats are insoluble in water and less dense than water, after meat that has a lot of fat in it has been cooked, upon cooling a layer of fat often appears on top of the juices. Fats and closely related oils are mixtures of compounds consisting of fatty acids combined with glycerol (commonly known as glycerin) via ester linkages. Fatty acids are long, straight chain carboxylic acids. A fat (or oil) is formed when three fatty acid molecules react with a glycerol molecule to yield a triglyceride (and three water molecules). Fats in the body are transported and stored as triglycerides.

Fat molecules are characterized as monoglycerides, diglycerides, or triglycerides, depending on whether there are one, two, or three fatty acid chains present in the molecules. Fatty acids in nature generally have an even number of carbon atoms because they are synthesized in cells via successive additions of two-carbon acetate groups in a stepwise cyclic reaction.

Fats and Oils. Dietary fats and oils are both triglycerides. Fats are generally solids and oils are generally liquids at ordinary room temperatures. The characteristics of fats and oils are related to the properties of the fatty acids that they contain. The larger the number of carbon atoms, the higher the melting point; the larger the number of double bonds, the lower the melting point. Oils contain a higher percentage of unsaturated fatty acids than fats. Fats from animal sources tend to be solids and fats from vegetable sources tend to be liquids. Thus fats are often referred to as “animal fats” and “vegetable oils”.

When fats or oils are exposed to air, they react with the oxygen or water vapor to form short-chain carboxylic acids. The short-chain acids are volatile and have unpleasant smells and tastes. For example, the strong smell and sour taste of vinegar are due to acetic acid, a two-carbon carboxylic acid. The oxidation process is called rancidification and can make foods unpalatable. The characteristic smell of rancid butter is due to the presence of butyric acid (a four-carbon acid). (Rancidity can also be the result of the hydrolysis of fats or oils.)

Saturated and Unsaturated Fatty Acids. When the fatty-acid molecule contains the maximum of hydrogen possible, the acid is said to be saturated fatty acid. It is saturated with respect to hydrogen. Myristic, lauric, palmitic, and stearic acids are such saturated acids. They are solids at ordinary temperatures. When the fatty-acid molecule does not contain the maximum amount of hydrogen possible, the acid is said to be an unsaturated fatty acid. It is unsaturated with respect to hydrogen.

Such unsaturated acids are oleic, linolic and linolenic acids. They are liquids at ordinary temperatures. By chemical means these acids may be made to take up, i.e., combine with, hydrogen. This process is known as hydrogenation.

Ex. 3. Answer the questions.

1. What is the role of food in human nutrition? 2. What is the role of fats in human nutrition? 3. How are fats used in the body? 4. What are the physical and chemical properties of fats? 5. What does the classification of fats depend on? 6. Fats in the body are transported and stored as triglycerides, aren't they? 7. How are fat molecules characterized? 8. What is the difference between fats and oils? 9. Are dietary fats and oils both triglycerides? 10. What is rancidification?

Ex. 4. Identify an odd word.

1. Fat, carbohydrate, protein, zinc. 2. On volatile, soluble in water, greasy to the touch, insoluble in water. 3. Margarine, avocados, cheese, eggs, nuts. 4. Colorless, odorless, combustible, tasteless.

Ex. 5. Match the words with their definitions.

1) greasy	a) oily in appearance, texture, or manner
2) rancid	b) any of a class of often fragrant organic compounds represented by the formula RCOOR and that are usually formed by the reaction between an acid and an alcohol with elimination of water
3) unpalatable	
4) ester	
5) lipid	
6) nutrition	c) a natural oily or greasy substance
7) fats	d) any of various substances that are soluble in non-polar organic solvents, that are usually insoluble in water
	e) the act or process of nourishing or being nourished; specifically the sum of the processes by which an animal or plant takes in and utilizes food substances
	f) having a rank smell or taste usually from chemical change or decomposition
	g) distasteful, disagreeable, unpleasant

Ex. 6. Prove whether the following statements are true or false.

1. Fats occur naturally in food and play a significant role in human nutrition. 2. Fat is one of the four main types of nutrient. 3. Fats also play in an important role in food preparation. 4. Fatty acids are long, straight chain carboxylic acids. 5. Fats are mixtures of compounds consisting of fatty acids combined with glycerol via ester linkages. 6. Fats are often

referred to as “animal fats” and “vegetable oils”. 7. Fats are generally liquids and oils are generally solids at ordinary room temperatures.

Ex. 7. Complete the sentences with the words from the table below.

tastes, acids, greasy, oils, rancidification, insoluble, carbon

1. Oils contain a higher percentage of unsaturated fatty … than fats. 2. Lipids are cellular compounds that are … in water. 3. Fats have a … feel and are slippery. 4. Fatty acids in nature generally have an even number of … atoms. 5. The oxidation process is called … and can make foods unpalatable. 6. The short-chain acids are volatile and have unpleasant smells and … . 7. Dietary fats and … are both triglycerides.

Ex. 8. Complete each sentence using a word derivationally related to the word given in brackets.

1. Fats occur naturally in food and play a significant role in human (nutrient). 2. Fatty acids in nature generally have an even number of carbon atoms because they are synthesized in cells via successive additions of two-carbon acetate groups in a stepwise cyclic (to react). 3. Fats occur (nature) in food and play a (to signify) role in human nutrition. 4. Lipids are based on long-chain (fat) acids. 5. Lipids are cellular compounds that are (soluble) in water. 6. Fats are (general) solids and oils are (general) liquids. 7. Fats also play in an important role in food (to prepare).

Ex. 9. Put the words in the right order.

1. rancidification / oxidation / called / the / process / is. 2. process / as / this / known / hydrogenation / is. 3. are / of / fats / made / macromolecules. 4. oils / fats / and / dietary / are / triglycerides. 5. short-chain / volatile / the / acids / are. 6. have / feel / a / greasy / fats. 7. temperature / acids / ordinary / saturated / at / are / solids.

Ex. 10. Say it in English.

Питание человека, нерастворимый в воде, плотность жиров, жирные кислоты, диетические жиры, свойство жиров, точка плавления, двойная связь, насыщенные жирные кислоты, животного происхождения, процесс окисления, характерный запах.

Ex. 11. Complete the sentences using the information from the text.

1. When fats or oils are exposed to air, they react with the oxygen or water vapor to form short-chain … . 2. Dietary fats and oils are both … . 3. Lipids are cellular compounds that are insoluble in … . 4. The short-chain acids are volatile and have unpleasant … . 5. When the fatty-acid

molecule contains the maximum of hydrogen possible, the acid is said to be a … . 6. Fats are used to store energy in the body, insulate body tissues, cushion internal organs, and … . 7. Fats from animal sources tend to be solids and fats from vegetable sources tend to be … .

1.5. POTASSIUM

Ex. 1. Read and learn the following words.

Abundant – обильный; clay – глина; to dissolve – растворять; dull – тусклый; to obtain – получать; oxidation – окисление; to prevent – предотвращать; pure – чистый; to reduce – снижать; shell – оболочка; to sink – тонуть; to store – хранить; tinge – оттенок.

Ex. 2. Read and translate the text.

Potassium

Early humans were familiar with potash, a potassium compound forms when wood burns. Wood ashes were washed with water to dissolve the potash. It was then recovered by evaporating the water. Potash was often called vegetable alkali. That name comes from the origin of the material ("vegetable" plants that contain wood) and the most important property of the material, alkali.

In 1807 potassium was first obtained by the electrolysis of its moist hydroxide by English chemist Sir Humphrey Davy. Then he repeated his experiment with soda ash and produced pure sodium metal. Davy named these two elements after their much older names: potassium for "potash" and sodium for "soda ash".

Potassium is widely used in industry, and also plays an important role in the biological sphere. In nature potassium is only encountered in compounds, because of its high chemical activity. The metal is the seventh most abundant and makes up about 1.5 % by weight of the Earth' crust. Potassium is an essential constituent for plant growth and it is found in most soils. It is also a vital element in the human diet. Potassium is a group 1 metal, abbreviated as K on the Periodic Table. In its pure form, potassium has a white-sliver color, but quickly oxidizes upon exposure to air and tarnishing in minutes if it is not stored under oil or grease. Potassium is essential to several aspects of plant, animal, and human life and is thus mined, manufactured, and consumed in huge quantities around the world.

Potassium is never found free in nature, but is obtained by electrolysis of the chloride or hydroxide, much in the same manner as prepared by Davy. It is one of the most reactive and electropositive of metals and, apart from lithium, it is the least dense known metal. It is soft and easily cut with a knife. It is silvery in appearance immediately after a fresh surface is exposed. It is as light a metal as lithium, so if a piece of it is placed in water, it will not sink, but remain afloat.

Potassium is a typical representative of alkaline metals, it is very active and has reducing properties. This element displays an oxidation state of +1. Potassium actively oxidizes in air, and swiftly grows dull, forming oxides and carbonate. So like all alkaline metals, it is stored in kerosene or petrol. These substances can protect alkaline metals from contact with water and the atmosphere.

Potassium reacts very violently with water, with ignition. If a small piece of potassium is immersed in a Petri dish filled with water, the swiftly released hydrogen explodes with a bang, and the potassium cations turn the flame bright purple. If phenolphthalein is added to the water beforehand, the potassium turns the water crimson in the reaction process, which is proof that an alkali forms in the solution – potassium hydroxide:

$$2K + 2H_2O \rightarrow 2KOH + H_2\uparrow$$

Unlike lithium and sodium, potassium does not react with nitrogen, but enters into reactions with oxygen, halogens etc. When it reacts with alcohols, the silvery metal forms alkoxides. The reaction of potassium and ethyl alcohol C_2H_5OH looks as follows:

$$2K + 2C_2H_5OH \rightarrow 2C_2H_5OK + H_2\uparrow$$

In the reaction of this alkaline metal with air, an oxide will not be formed. The results of the reaction will be potassium superoxide with a mixture of peroxide. Potassium peroxide is a white powder with a yellow tinge, K_2O_2, and potassium superoxide has an orange-yellow color and the formula KO_2.

Potassium in the Environment. Potassium has a 2.6 % abundance by mass in the earth's crust and is found mostly in mineral form as part of feldspars (groups of minerals) and clays. Potassium easily leaches out of these minerals over time and thus has a relatively high concentration in sea water as well. Today, most of the world's potassium is mined in Canada, the U.S., and Chile but was originally monopolized by Germany.

Potassium and Living Organisms. Plants, animals and humans all depend on potassium for survival and good health. The element is part of many bodily fluids and assists related functions of the human body. Most notably, potassium aids nerve functions and is found in several cell types (including skeletal cells, smooth muscle cells, endocrine cells, cardiac cells, and central neurons). Plants depend on potassium for healthy growth. Potassium found in animal excretions and dead plants easily binds to clay in the soil they fall on and is thus utilized by plants. The element helps maintain osmotic pressure and cell size and plays a role in photosynthesis and energy production.

Ex. 3. Answer the questions.

1. When was first potassium obtained? 2. Where is potassium used? 3. Where is potassium on the periodic table? 4. Is potassium metal or non-metal? 5. Potassium is never found free in nature, isn't it? 6. What are the physical properties of potassium? 7. What are the chemical properties of potassium? 8. What does potassium react with? 9. Why do plants, animals and humans depend on potassium? 10. Where is the most world's potassium mined?

Ex. 4. Identify an odd word.

1. Avocados, bananas, watermelon, spinach, potato. 2. Solid, silver-white, melting point 151°C, atomic number 19. 3. Canada, the USA, Chile, Russia. 4. K, Ti, Fe, O, Cu.

Ex. 5. Match the words with their definitions.

1) anion	a) shade of some color
2) flexible	b) to accumulate (smth.) for future use
3) cation	c) easy to mold, cut or fold
4) tinge	d) capable of bending easily without breaking
5) to store	e) become combined chemically with oxygen
6) to oxidize	f) a positively charged ion
7) soft	g) a negatively charged ion
8) electrolysis	j) chemical decomposition produced by passing an electric current through a liquid or solution containing ion

Ex. 6. Prove whether the following statements are true or false.

1. Potassium is a group 1 metal, abbreviated as K in the Periodic Table. 2. In 1810 potassium was first obtained by the electrolysis. 3. In nature potassium is only encountered in compounds, because of its high chemical activity. 4. Potassium is the fifth most abundant. 5. Potassium is also a vital element in the human diet. 6. Potassium has a brownish-red

color. 7. It is soft and easily cut with a knife. 8. Potassium reacts very violently with water, with ignition. 9. Potassium has a 3.6 % abundance by mass in the earth's crust. 10. Plants depend on potassium for healthy growth.

Ex. 7. Complete the sentences with the words from the table below.

oxidation, plant, electrolysis, human, react, industry, chemist, vegetable

1. Potash was often called … alkali. 2. Potassium was first obtained by English … Sir Humphrey Davy. 3. Potassium is widely used in … . 4. Potassium is an essential constituent for … growth. 5. Potassium is obtained by … of the chloride or hydroxide. 6. Potassium is essential to several aspects of plant, animal, and … life. 7. This element displays an … state of +1. 8. Unlike lithium and sodium, potassium does not … with nitrogen.

Ex. 8. Complete each sentence using a word derivationally related to the word given in brackets.

1. Potassium plays an important role in the (biology) sphere. 2. It is one of the most (to react) and electropositive of metals. 3. It is soft and (easy) cut with a knife. 4. Potassium is a typical (to represent) of alkaline metals. 5. Potassium (active) oxidizes in air. 6. Potassium reacts very (violent) with water, with ignition. 7. Potassium is found (most) in mineral form as part of feldspars and clays. 8. The element plays a role in photosynthesis and energy (product).

Ex. 9. Put the words in the right order.

1. were / potash / humans / familiar / with / early. 2. often / was / alkali / called / potash / vegetable. 3. 1807 / obtained / was / first / in / potassium. 4. encountered / nature / in / potassium / in / is / compounds. 5. soils / in / found / it / is / most. 6. free / never / potassium / is / found / nature / in. 7. very / and / properties / is / it / has / reducing / active. 8. potassium / with / not / react / does / nitrogen.

Ex. 10. Say it in English.

Химическая активность, желтый оттенок, мягкий щелочной металл, окисление, земная кора, серебристо-белый, электролиз, остаться на плаву, белый порошок, высокая концентрация, в большом количестве, встречается в соединении, сильно реагировать с водой.

Ex. 11. Complete the sentences using the information from the text.

1. Potash was often called … . 2. In 1807 potassium was first obtained by the electrolysis of its moist hydroxide by … . 3. In nature

potassium is only encountered in compounds, because of its … . 4. Potassium reacts very violently with … . 5. Potassium is a typical representative of alkaline metals, it is very active and has … . 6. Potassium is the seventh most abundant and makes up about 1.5 % by weight of … . 7. Potassium actively oxidizes in air, and swiftly grows dull, forming … . 8. Plants, animals and humans all depend on potassium for … .

GRAMMAR TEST ON MODULE 1

Note! Before performing the following exercises, it is recommended to repeat *to be*, *to have*; *nouns*; *pronouns*; and *adjectives* (positive, comparative, superlative; degrees of comparison).

1. Use the correct form of the following verbs: *to have*, *to be*. Name their function in the sentences below.

1. How old … you? – I … 18. 2. It … difficult to find a job now, … it? 3. I want … an engineer. 4. There … only four faculties at the University in 1960. 5. My sister … a second-year student of the Economic Engineering Faculty. She … an engineer. 6. Will you … any lectures tomorrow? 7. He … a lot of trouble with his car yesterday. 8. I … no time to help you yesterday. 9. The Republic of Belarus … various natural resources and … one of the most picturesque countries in the world. 10. My mother … short brown hair but my grandmother's hair … long and thick.

2. To complete the sentences below choose the correct form of the following verbs: *to have*, *to be*.

There's / 're a lamp above the picture. There is / are a bed near the wall and there is / are a lamp above it. Near the wall there is / are a table with a telephone on it. There is / are pillows on the bed. There is / are a rug near the bed. There is / are a sofa near the door. There is / are a rug in front of the sofa. To the right of the window there is / are a stereo. On the wall behind the stereo there's / 're a picture.

3. Translate the sentences into Russian.

1. Вы были на концерте в воскресенье? – Нет, я была занята тогда. 2. Когда у вас будут каникулы? – Через неделю. 3. Где вы отдыхали прошлым летом? 4. Если вы свободны сейчас, давайте пойдем поужинаем куда-нибудь. 5. Откуда вы родом? – Мы из Беларуси. 6. У нас будет лекция по химии завтра. 7. Ты завтракал

дома вчера, не так ли? 8. У студентов занятия шесть дней в неделю. 9. У тебя есть деньги с собой? 10. У тебя было время подготовиться к экзамену?

4. Make the following nouns plural.

1) bag, dog, bird, verb, pan, hen, spoon, noun, room, ring, thing, evening, song, girl; 2) tree, pie, cow, fly, lady, baby, teacher, letter, mirror, berry, play, toy, city, jacket; 3) cake, snake, fork, map, lamp, hat, clock, rat, coat, goat, skirt, shirt, plant, army; 4) shelf, leaf, knife, wife, roof, chief, handkerchief, wolf, safe, cliff, thief, life; 5) bus, class, glass, dress, piece, slice, horse, house, rose, nose, blouse, fox, box; 6) bench, bridge, cage, cottage, bush, radish, page, bush, torch, match; 7) man, woman, child, foot, tooth, goose, mouse, ox, fish, trout, fruit, swine, mouse, louse, deer, sheep; 8) phenomenon, crisis, stimulus, formula, thesis, criterion, datum.

5. Choose the right number of nouns in the sentences below.

1. The glass / glasses is full. 2. The pencil / pencils is short. 3. He is a child / children. 4. The men / man is in the park. 5. His tooth / teeth are white. 6. The women / woman are in the shop. 7. The mouse / mice is in the hole. 8. We are a fireman / firemen. 9. I see two box / boxes. 10. He has got two nieces / niece.

6. Make nouns in brackets plural and complete the sentences.

1. These (person) are protesting against building an atomic power station. 2. The (woman) over there want to meet the manager. 3. My (child) hate eating pasta. 4. I am ill. My (foot) hurt. 5. I clean my (tooth) three times a day. 6. The (student) are doing the exercise right now. 7. They are sending some (man) to fix the roof. 8. Most (housewife) work more than ten hours a day at home. 9. (Goose) like water. 10. (Piano) are expensive.

7. Translate into Russian.

A tennis ball; a bank manager; a television producer; a road accident; income tax; the city center; a television camera; language problems; a vegetable garden; a television program; apple juice; trade talks; consumer goods; food sales; exchange rate; wheat consumption; flax production; power station equipment; cane sugar; sugar cane; coal supply situation; a television studio; temperature changes; lecture hall; water supply.

8. Replace the words in italics with personal pronouns.

1. *The teacher* is helping *the students* to translate the article. 2. *Mother* will send *Mary* to buy *the tickets*. 3. *The man* gave *the books*

to *the boy*. 4. *My friend* is going to write *a letter* to his *sister* today. 5. *This book* is not suitable for *young children*. 6. *Helen* worked hard at *history*.

9. Insert a possessive pronoun.

1. I have left fountain-pen at home. Can you lend me … . 2. They have no dictionaries, we can lend them … . 3. The children had had … tea. Kate was late for … as usual, Mary and Paul were having … . 4. They have a garden, but … garden is very small.

10. Complete the sentences. Use a reflective pronoun.

1. She told us very little about … . 2. I bought these magazines for … . 3. Did you buy this television set for … ? 4. People protect … from the rain with an umbrella. 5. We'll speak to him … . 6. Children, go there … .

11. Write questions to the words in italics, using the following question words: *who, whom, whose, what, which*.

1. I am looking *at him*. 2. Jonh is *a doctor*. 3. They are talking *about the international situation*. 4. They are *painters*. 5. That is *my sister's* dog. 6. Some English *books* are lying on the table. 7. *The children* are sitting under the tree. 8. He is waiting *for me*. 9. That man is *our Vice-Rector on Student Life*. 10. That book is *mine*. 11. May is *the fifth* month of the year. 12. The *dining* room is the largest room in our house. 13. The handbag is made of *leather*.

12. Complete the following sentences. Use a proper pronoun.

1. Who are those people? Do you know … ? 2. You can help Tom and Tom can help you. So you and Tom can help … . 3. We didn't go to Ann's party. She didn't invite … . 4. Mary and Jane were at school together but they never see … now. 5. Diana and I are good friends. We've known … for a long time.

13. Fill in the blanks with an indefinite pronoun: *some, any*, or *no*.

1. Did you find … interesting books in this library? – No, I didn't find … . 2. He didn't bring … water, though I asked him to bring me … . 3. I left my money at home, so I can't give you … . 4. There is … water in this cup, but there isn't … in the kettle. 5. I didn't buy … meat today, as my sister brought me … very good meat yesterday.

14. Insert *somebody, someone, anybody, anyone, something or anything* where necessary.

1. Have you heard … about him since that time? 2. Does … know about it? 3. Did you see … there? 4. Give me … to eat, I am hungry.

5. We have not asked … about it. 6. Did … ring me up? 7. Is there … new? 8. … wants to speak to you.

15. Write the comparative and superlative forms of the following adjectives according to the rule in the table.

Positive degree	Comparative degree	Superlative degree
cold	cold*er*	*the* cold*est*
heavy	heav*ier*	*the* heav*iest*
interesting	*more* interesting	*the most* interesting
good	*better*	*the best*
bad	*worse*	*the worst*
much / many	*more*	*the most*
little	*less*	*the least*
far	*farther* / *further*	*the farth**est*** / *the furth**est***

Long, pensive, strong, difficult, intelligent, close, popular, safe, important, loud, weak, tasty, comfortable, delicious, easy, careful, fast, light, beautiful, big, bright, responsible, small, citing, pretty, cheap.

16. Form a comparative and superlative degree of the following adjectives.

Big, heavy, short, dirty, clean, near, bad, famous, little, much, clever, good expensive, cheap, important, pale, hot, beautiful, large, practical, fat, early, pretty, happy, bright, dark, dry, flat, fresh, full, quick, late, nice, rich, sad, thin, thick, wet.

17. Complete the sentences with the necessary degree of adjectives.

1. A train is (fast) than a bus. 2. This text is the (interesting) of all. 3. Park Street is (beautiful) than Market Street. 4. This jacket is small for me. Show me a (large) one. 5. What is the (important) thing in life? 6. Helen is the (clever) girl in our class. 7. Jill's a far (intelligent) person than my brother. 8. Kate was the (practical) of the family. 9. Greg felt (bad) yesterday than the day before. 10. Jack was the (tall) of the two.

18. Use *more* or *less*.

1. People are … intelligent than monkeys. 2. Summer holidays are … splendid than winter holidays. 3. Maths is … important than English. 4. Books are … interesting than films. 5. Writing in English is … difficult than speaking. 6. Parents are … helpful than teachers. 7. Reading is … useful than watching TV. 8. Food is … expensive than clothes.

19. Compare using *as … as* according to the model.

Maths and English (difficult). → *Maths is as difficult as English.*

1. The temperature today and yesterday (high). 2. History and Russian (interesting). 3. He and his brother (strong). 4. This street and the next street (wide). 5. His computer and mine (powerful). 6. She and her sister (tall). 6. This room and all the rooms in the house (spacious).

20. Compare using *not as (so) … as* according to the model.

Playing computer games and reading books (useful). → *Playing computer games is not as (so) useful as reading books.*

1. Weather in autumn and weather in summer (pleasant). 2. A bike and a motor-bike (comfortable). 3. A snake and a crocodile (dangerous). 4. Shoes and coats (expensive). 5. Holidays and week-ends (wonderful). 6. Ann and Nell (beautiful).

21. Open the brackets using the required form of the adjective.

1. Which is (large): the Republic of Belarus or England? 2. Moscow is the (large) city in Russia. 4. The London underground is the (old) in the world. 5. There is a (great) number of cars and buses in the streets of Moscow than in any other city of Russia. 6. St. Petersburg is one of the (beautiful) cities in the world. 7. The rivers in America are much (big) than those in England. 8. The island of Great Britain is (small) than Greenland. 9. What is the name of the (high) mountain in Asia? 10. The English Channel is (wide) than the straits of Gibraltar. 11. Australia is a very (large) country.

TEXTS AND EXERCISES FOR THE 2nd TERM

2.1. METALS AND NONMETALS

Ex. 1. Read and learn the following words.

Actinide – актинид, актиноид; alkali – щелочь, щелочной; carbon – углерод; conductor – проводник (электрического тока, тепла, звука, света и др.); to corrode – ржаветь, подвергаться коррозии; density – плотность, удельная масса; diamond – алмаз; halogens – галоген; hydrogen – водород; lanthanide – лантанид, лантаноид, редкоземельный элемент; lithium – литий; liquid – жидкий; malleable – ковкий, пластичный; mercury – ртуть; nitrogen – азот; noble gas – инертный газ, благородный газ; oxygen – кислород; phosphorus – фосфор; potassium – калий; property – свойство, качество, отличительная черта, особенность; selenium – селен; sodium – натрий; solid – твердый, цельный, чистый, без примесей; sulfur – сера; transition – переходный; wire – провод, проволока.

Ex. 2. Read and translate the following text.

Metals and Nonmetals

Most of the chemical elements around us are either metals or nonmetals according to their shared physical and chemical properties. The majority of the chemical elements in pure form are classified as metals. There are five different kinds of metals: alkali metals, alkali earths, transition metals, lanthanides, actinides. Most metals have a solid state when they are at room temperature. The only exception to this property is mercury – it is the only metal that is always liquid no matter the temperature. Generally, the melting point of metals is high.

Metals tend to be shiny, usually perform as good conductors of heat and electricity. But, at the same time, they have low ionization energies and low electronegativity. Another important property that many metal elements share is that they are malleable. This means that metals are relatively easy to be broken up and can be made into wire. With the exception of potassium, lithium, and sodium, most metals have a high density. One of the common and most noticeable properties that most

metal elements share is that they corrode when exposed to seawater or air. Finally, most metal elements lose electrons during reactions.

Very few elements in the periodic table are nonmetals. They are hydrogen, carbon, nitrogen, phosphorus, oxygen, sulfur, selenium, all the halogens, and the noble gases. Nonmetals have properties opposite those of the metals. For example, they are not malleable, they have relatively low density, they are poor conductors of heat and electricity, etc. Nonmetals may be solids, liquids or gases at room temperature.

There is one nonmetal element that can sometimes act as a metal. This is hydrogen that, when exposed to either extremely high or extremely low temperatures, can display some common properties of metals.

Also, there exist metalloids – chemical elements which have properties in between those of metals and nonmetals, or that has a mixture of them. Metalloids can also be called semi-metals.

Both nonmetals and metals take different forms which have different shapes and properties compared to each other. Then we may speak about allotrope – each of two or more different physical forms in which an element can exist. For example, diamond and graphite are two allotropes of nonmetal carbon, whereas austenite and ferrite are two allotropes of iron.

Ex. 3. Answer the questions.

1. What group of chemical elements is the largest? 2. How many kids of metals exist? What are they? 3. What are the main properties of metals? 4. How can you characterize nonmetals? 5. Are there any exceptions speaking about common properties of nonmetals? 6. What are metalloids? 7. What does it mean when it is mentioned that an element has several allotropes?

Ex. 4. Identify an odd word.

1. Property – trait – characteristic – strangeness. 2. Blend – conductor – mixture – alloy. 3. Liquid – invention – solid – gas. 4. Potassium – oxygen – sodium – curriculum.

Ex. 5. Match the words with their definitions.

1) electricity	a) the quality of being hot, high temperature
2) conductor	b) a material or object that permits an electric current to flow easily
3) malleable	
4) density	c) the degree of compactness of a substance
5) to corrode	d) flexible, soft and can easily be made into different shapes
6) opposite	
7) heat	e) completely different, of a contrary kind

8) to expose	f) a combination or blend of different elements, kinds, qualities, etc.
9) property	g) to exhibit, display, to uncover or bare to the air, cold, etc.
10) mixture	h) a form of energy resulting from the existence of charged particles (such as electrons or protons), either statically as an accumulation of charge or dynamically as a current
	i) an essential or distinctive attribute or quality of a thing
	j) to destroy or damage (metal, stone, or other materials) slowly by chemical action

Ex. 6. Prove whether the following statements are true or false.

1. Most of the chemical elements around us are metals or semimetals according to their shared physical and chemical properties. 2. The majority of the chemical elements form the group of nonmetals. 3. The melting point of metals is quite low. 3. To corrode means to burn and to collapse because of it. 4. All metals have a high density. 5. Nonmetals have a lot of similarities with metals. 6. Nonmetals are good conductors of heat and electricity. 7. Metals usually have a liquid form at room temperature. 8. Nonmetals can only be gases. 9. Metalloids are allotropes of metals. 10. Allotrope is one of different chemical forms in which an element can exist.

Ex. 7. Complete the sentences with the words from the table below.

diamond, solid, melt, exception, mercury, potassium, chemistry, oxygen, corrosion, dense

1. He used to work in the … mines of South Africa. 2. Usually … turn to liquids at certain temperatures. 3. The Republic of Belarus is famous for its deposits of … salt. 4. The heat … the plastic tablecloth. 5. … is her major at the university. 6. … is a silver-colored liquid metal that is traditionally used in thermometers and barometers. 7. There was quite a lot of … on the bottom of the car. 8. We could see a huge cloud of … smoke stretched across the horizon. 9. As far as you know, there are … to almost every rule. 10. We breathe in … and breathe out carbon dioxide.

Ex. 8. Complete each sentence using a word derivationally related to the word given in brackets.

1. You should … it carefully – cream should have the right consistence (mixture). 2. Dmitry Mendeleev was a great Russian …

(chemistry). 3. The region has a very high population … (dense). 4. It was a victory, he won by an overwhelming … (major). 5. You should … the pan first if you want to fry an egg (heat). 6. This material … electricity very well (conductor). 7. There was a … smell of burning coming from the window (notice).

Ex. 9. Put the words in the right order.

1. classified / elements / are / majority / as / pure / of / chemical / the / in / the / form / metals. 2. sometimes / nonmetal / act / a / can / there / that / is / as /one / metal / element. 3. high / of / point / metals / metals / generally / the / melting / is. 4. properties / have / of / those / nonmetals / opposite / the / metals. 5. be / also / semi-metals / can / metalloids / called. 6. lose / during / electrons / most / reactions / elements / metal. 7. forms / is / of / allotrope / physical / two / more different / in / or / an / exist / which / element / can / each.

Ex. 10. Say it in English.

Твердое агрегатное состояние, комнатная температура, независимо от температуры, температура плавления, периодическая система химических элементов, относительно низкая плотность, принимать различные формы.

Ex. 11. Complete the sentences using the information from the text.

1. The majority of the chemical elements … . 2. Metals tend to be … . 3. One of the common and most noticeable properties that most metal elements share is … . 4. Nonmetals have properties … . 5. There also exist metalloids … . 6. Both nonmetals and metals … . 7. For example, diamond and graphite are … .

2.2. WATER

Ex. 1. Read and learn the following words.

Access – доступ; agriculture – сельское хозяйство; cell – клетка; constituent – компонент, составляющая; to dissolve – растворять, разжижать; essential – основной, необходимый, существенный; fluid – жидкость; fresh water – пресная вода; goods – товары, изделия, продукция; interstitial – промежуточный, внутритканевый; nutrient – питательное вещество; particle – частица; to recycle – повторно использовать, перерабатывать; solution – раствор; substance –

вещество; surface – поверхность; thoroughly – тщательно, основательно; vital – жизненно важный, необходимый, существенный; weight – вес.

Ex. 2. Read and translate the following text.

Water

Water is an odorless, tasteless, transparent liquid. Water is the main constituent of Earth's streams, lakes, oceans, and the fluids of most living organisms. Its chemical formula is H_2O, meaning that each of its molecules contains one oxygen and two hydrogen atoms that are connected by covalent bonds.

Water covers 71 % of the Earth's surface. The Earth's supply of water is constantly being recycled. The water cycle is the continuous exchange of water within the hydrosphere, between the atmosphere, soil water, surface water, groundwater, and plants.

Water is vital for all known forms of life. It is essential to all living things, plant and animal. We drink it, we wash with it, we cook in it. In fact, we ourselves are more than half water. About two-thirds of the weight of an adult human consists of water. About two-thirds of this water is located within cells, while the remaining third consists of extracellular water, mostly in the blood plasma and in the interstitial fluid that bathes the cells.

Safe drinking water is essential to humans and other life forms even though it provides no calories or organic nutrients. Access to safe drinking water has improved over the last decades in almost every part of the world, but about one billion people still lack access to safe water and over 2.5 billion lack access to adequate sanitation.

Water plays an important role in the world economy. Approximately 70 % of the fresh water used by humans goes to agriculture. Fishing in salt and fresh water bodies is a major source of food for many parts of the world. Various goods are transported through seas, rivers, lakes, and canals. Large quantities of water, ice, and steam are used for cooling and heating, in industry and homes.

All of the water on Earth is in the form of solutions. We never see absolutely pure water because it dissolves so many substances. They change the properties of water from what they would be in absolutely pure water. They affect its freezing point and its boiling point, among many other physical and chemical properties. The substances in water can be in the form of ions, molecules, or larger particles. For drinking

water, bacteria must also be killed. If we want pure water we have to prepare it thoroughly by such means as distillation, ion exchange, and reverse osmosis.

Ex. 3. Answer the questions.

1. What are the main physical and chemical characteristics of water? 2. Is water important for our planet? 3. Why it is necessary for all living beings? 4. Does everyone have access to safe drinking water? 5. How water is interconnected with the world economy? 6. Does water mostly exist in a pure form? 7. What people do to purify water?

Ex. 4. Identify an odd word.

1. Water – liquid – fluid – solid. 2. Desert – stream – river – lake. 3. Oxygen – hydrogen – osmosis – silicone. 4. Distillation – purification – cleansing – contamination.

Ex. 5. Match the words with their definitions.

1) surface	a) to make or become better
2) stream	b) to reuse, or cause to pass through a cycle again
3) to recycle	c) any flow of water or other liquid or fluid
4) improve	d) a system for protecting people's health by removing dirt and waste
5) distillation	e) the action of purifying a liquid by a process of heating and cooling
6) substance	f) the point or place from which something originates
7) sanitation	g) the outside part or upper layer of something
8) fishing	h) a particular kind of matter with uniform properties
9) bond	i) something that binds, connects, or holds together
10) source	j) the activity of catching fish, either for food or as a sport

Ex. 6. Prove whether the following statements are true or false.

1. Water is a liquid, that has a particular color, sent and taste. 2. One-quarter of human body is water. 3. Drinking water may provide useful organic nutrients to all living beings. 4. Most people have an access to safe drinking water. 5. The major part of Earth's water exists in pure form. 6. Various dissolved substances change the properties of water. 7. The presence of bacteria in water doesn't create a danger for human life.

Ex. 7. Complete the sentences with the words from the table below.

quantity, particle, constituent, boil, improve, essential, transparent, contain, provide, approximately

1. We should pay more attention not to the … but to the quality of our products. 2. I stood in the kitchen, waiting for the water to … . 3. To … your health you should go in for sports. 4. Does this solution … alkali? 5. The sauce is an … part of this recipe. 6. Methane is the main … of natural gas. 7. Our containers are made from … plastic, non-toxic and recyclable. 8. It is a new scheme to … schools with free computers. 9. Dust … must have got into the engine, and now it is not working. 10. The Earth takes … 365 days to go round the Sun.

Ex. 8. Complete each sentence using a word derivationally related to the word given in brackets.

1. The production was … from this area because of the danger of earthquakes (transport). 2. The … of his argument was that education should continue throughout life (essential). 3. The … between smoking and heart disease is well known (connect). 4. Now we can observe a definite … in the state of economy of our country (improve). 5. … area of Great Britain includes more than three-quarters of the country's land area (agriculture). 6. The exact … of the factory has yet to be decided (locate). 7. If you want to get a result you should … your studies (continuous).

Ex. 9. Put the words in the right order.

1. main / constituent / streams / and / of / water / is / most / Earth's / fluids / the / oceans / the / organisms / lakes / of / living. 2. all / of / known / life / for / water / vital / forms / is. 3. about / weight the / an / of / human / adult / two-thirds / of / consists / water / of. 4. humans / essential / safe / to / and / drinking / forms / other / is / water / life. 5. role / the / important / an / economy / water / world / plays / in. 6. pure / absolutely / we / never / it / see / so / water / substances / because / many / dissolves. 7. bacteria / be / for / also / drinking / killed / must / water.

Ex. 10. Say it in English.

Прозрачная жидкость, главная составляющая, живые организмы, земная поверхность, доступ к питьевой воде, играть важную роль, температура замерзания, температура кипения, физические и химические свойства.

Ex. 11. Complete the sentences using the information from the text.

1. Water is the main constituent of … . 2. Its chemical formula is … . 3. The water cycle is … . 4. About two-thirds of the weight of an adult human … . 5. About one billion people still … . 6. Approximately 70 % of the fresh water … . 7. We never see absolutely pure water because … .

2.3. SILICON

Ex. 1. Read and learn the following words.

Alloy – сплав; ancient – древний; concrete – бетон; crust – кора (земная); to distribute – распространять, распределять; flint – кремень; impact – влияние, воздействие; lustre – блеск, глянец, лоск; mankind – человечество; to obtain – получать, добывать, приобретать; principal – главный, основной; semiconductor – полупроводник; silicon – кремний; stir – перемешивать, взбалтывать; tool – инструмент, орудие, орудие производства; universe – вселенная; widespread – широко распространенный, часто встречающийся.

Ex. 2. Read and translate the following text.

Silicon

Silicon is the eighth most common element in the universe by mass, but very rarely occurs as the pure element in the Earth's crust. It is a hard and brittle crystalline solid with a blue-grey metallic lustre, it is a tetravalent metalloid and semiconductor. The element is most widely distributed in dusts, sands, planetoids, and planets as various forms of silicon dioxide (silica) or silicates. Over 90 % of the Earth's crust is composed of silicate minerals, making silicon the second most widespread element in the Earth's crust after oxygen.

Silicon is one of the most useful elements to mankind. Silica in the form of sharp flints were among the first tools made by humans. The ancient civilizations used other forms of silica such as rock crystal, and knew how to turn sand into glass.

The credit for discovering silicon goes to the Swedish chemist Johns Jacob Berzelius of Stockholm who, in 1824, obtained silicon by heating potassium fluorosilicate with potassium. The product was contaminated with potassium silicide, but he removed this by stirring it with water, with which it reacts, and thus obtained relatively pure silicon powder.

Elemental silicon has a large impact on the modern world industry and economy. It is used to make alloys including aluminium-silicon and iron-silicon that are used to deoxidize steel and to make dynamo and transformer plates, engine blocks, cylinder heads and machine tools.

Silicon is also used to make silicones – silicon-oxygen polymers with methyl groups attached. Silicone oil is a lubricant and is added to some cosmetics and hair conditioners. Silicone rubber is used as a waterproof sealant in bathrooms and around windows, pipes and roofs.

Granite and most other rocks are complex silicates. They are used for civil engineering projects. Sand (silicon dioxide or silica) and clay (aluminium silicate) are used to make concrete and cement. Sand is also the principal ingredient of glass, which has thousands of uses. Silicon, as silicate, is present in pottery, enamels and high-temperature ceramics. Silicon carbides are important abrasives and are also used in lasers.

Moreover, the element silicon is widely used as a semiconductor in solid-state devices in the microelectronics industries – most computers, cell phones, and modern technology depend on it.

Ex. 3. Answer the questions.

1. Is silicone a widespread element? 2. Does Earth's crust contain silicone? 3. How long does the humanity use silicone for its needs? 4. Who is the discoverer of this chemical element? 5. Does silicone matter in the modern world industry? 6. In what branches of industry is it used? 7. In what way the production of contemporary devices such as computers and cell phones is connected with silicone?

Ex. 4. Identify an odd word.

1. Invention – discovery – finding – connection. 2. Include – contain – exclude – comprise. 3. Sphere – institution – branch – field. 4. Modern – contemporary – current – ancient.

Ex. 5. Match the words with their definitions.

1) production	a) a thing made or adapted for a particular purpose, especially a piece of mechanical or electronic equipment
2) crust	b) the process of making or growing something for sale or use
3) tool	c) a hard, dry layer on the surface of something
4) alloy	d) a gas with no smell or color, the life-supporting component of the air
5) device	e) economic activity concerned with the processing of raw materials and manufacture of goods in factories
6) oxygen	f) a mixture of metals or a mixture of a metal and another element
7) mankind	g) the whole human race
8) industry	h) any instrument or simple piece of equipment, especially one held in the hand, used to do a particular kind of work
9) chemist	i) a person who does research connected with chemistry or who studies chemistry
10) glass	j) a hard, transparent material, used to make windows, bottles, and other objects

Ex. 6. Prove whether the following statements are true or false.

1. Silicone takes the fifth place in the list of most widespread elements in the universe and the third – on the Earth. 2. Usually silicone occurs as a pure element. 3. People started to use silicone actively not long ago. 4. As a chemical element silicone was discovered by an Englishman. 5. Silicon is used only in the production of construction materials. 6. Silicone oil may be found in cosmetics. 7. Silicone is used as a conductor in various electronic devices.

Ex. 7. Complete the sentences with the words from the table below.

industry, chemistry, distribution, contaminated, steel, device, impact, principal, human, ingredient

1. Heavy … is the basis of this country's economy. 2. You should remember that you are only a … , you have a right to make mistakes. 3. The … of goods in this region is under control of the Central Delivery Organization. 4. Young people can not imagine their lives without … these days. 5. … was my major at college. 6. This equipment is made from iron and … . 7. The alloy can't be made without this … . 8. Books have always been my … source of knowledge. 9. Our soil and water were … after the nuclear disaster in Chernobyl. 10. The anti-smoking campaign made a serious … on young people.

Ex. 8. Complete each sentence using a word derivationally related to the word given in brackets.

1. This company … popular electronic devices (production). 2. … and pharmaceutical industries are well-developed in Great Britain (chemistry). 3. … analyses is a process where a sample is analyzed for its elemental and isotopic composition. 4. His major pride was his … of a new chemical element (discover). 5. If something is … , it is possible to get or achieve (obtain). 6. One should be extremely careful with the … of equipment (use). 7. The reaction is impossible without some special mechanism for example, this mechanical … (stir).

Ex. 9. Put the words in the right order.

1. elements / useful / silicon / to / is / one / mankind / of / most / the. 2. form / first / in / humans / the / sharp / by / among / the / flints / tools / silica / of / were / made. 3. modern / has / a / impact / economy / large / the / world / and / industry / on / silicon / elemental. 4. methyl / silicon-oxygen / groups / attached / with / is / silicones / polymers. 5. make / used / are / clay / and / cement / and / to / sand / concrete. 6. some / conditioners / added / cosmetics / and / hair / is / oil / to / silicone. 7. depend / modern / technology / computers / phones / most / silicone / and / cell / on.

Ex. 10. Say it in English.

Редко встречается, наиболее широко распространен, древние цивилизации, иметь большое влияние, основной ингредиент, широко применяться, зависеть от чего-либо.

Ex. 11. Complete the sentences using the information from the text.

1. The element is most widely distributed … . 2. The ancient civilizations used other forms of silica … . 3. The credit for discovering silicon goes to … . 4. Elemental silicon has a large impact on … . 5. Sand is also the principal ingredient of … . 6. Silicon carbides are … . 7. Moreover, the element silicon is widely used as … .

2.4. MACHINES AND APPARATUSES OF CHEMICAL PRODUCTION. MIXING DEVICES

Ex. 1. Read and learn the following words.

To accelerate – ускорять, разгонять; advantage – преимущество; axis – ось, осевая линия; batch – порция, партия, дозировка; blade – лезвие; bottom – дно; capacity – емкость, вместимость, объем, мощность; continuously – постоянно, непрерывно, продолжительно; direction – направление; drum – барабан, цилиндр; evaporation – испарение, парообразование; homogeneous – однородный; to induce – побуждать, вызывать, стимулировать, направлять; kneading – месильный; mixing – смешивание, перемешивание; moderate – умеренный, средний; to obtain – получать, добывать; paddle – лопасть, мешалка; require – требовать; rotate – вращать; shaft – шток, стержень, ось; stiff – жесткий, тугой, неэластичный; stirrer – мешалка, смеситель; suspension – суспензия, взвесь; tank – бак, резервуар, цистерна; trough – желоб, лоток; uniform – однородный; viscous – вязкий, густой, липкий, тягучий; whipper – взбивалка, взбивальная машина.

Ex. 2. Read and translate the following text.

Machines and Apparatuses of Chemical Production. Mixing Devices

Mixing is widely used in chemical industry for producing different kinds of solutions and suspensions to accelerate chemical reactions, evaporation or burning. The field of mixing may be divided into three

parts: the mixing of liquids with liquids, the mixing of liquids with solids, and the mixing of solids with solids. It is not easy to divide the mixing equipment in the same way because many devices can be used for different kinds of mixing.

The simplest form of mixing devices is a paddle stirrer. It has two flat paddles set horizontally in the tank. The paddles can have various forms. They are carried on a vertical shaft moved by a driving gear. The paddles may be set on the shaft at different heights of the tank to accelerate the process of mixing. Paddle stirrers have a simple construction which makes the cost of these machines and the process of mixing rather cheap. One more advantage of this kind of mixers is that they have a good quality of mixing at small use of energy.

When the operation of mixing requires intensification, propeller stirrers are used. The process of mixing in these machines is much faster. The main part of the propeller stirrer is the propeller, which consists of three blades and is set on the shaft in the tank. The liquids pass in the direction of the rotated axis, moving around in the tank. In modern practice, only a few minutes are necessary to get a homogeneous mixture of liquids or of liquids with solids.

Kneading machines are used for mixing viscous masses, such as pastes, plastics, and all kinds of stiff materials. They consist of an open through with a semicylindrical bottom. Within the trough two horizontal knives rotate. These machines are built in large sizes and may have large operating capacities.

Spiral ribbon stirrers of different types are used for mixing dry powders. The complete mixing of dry powders is very difficult operation to perform. The batches are mixed in semicylindrical troughs provided with spiral ribbon stirrers. The materials move continuously back and forth until we get the necessary homogeneous mixture.

The liquids are mixed with moderate amounts of solids in the beaters. This device consists of a whipper driven at high speeds in the container. The whipper rotates about its own axis, which revolves about the centre of the container.

A horizontally rotatable drum and a rotatable shaft fitted with stirring blades are constructed for obtaining a uniform mixture of granulated or powdered materials. The blades induce the flow of the materials towards the centre of the drum.

Liquids may be mixed by bubbling compressed air, which passes through the coils in the bottom of the tank. This method is used when a

large amount of one material is mixed with a small amount of another material. But the process of mixing by compressed air is very expensive as it requires a lot of energy.

The need to produce a wide variety of synthetic plastics and rubber compounds has led to the development of complex compounding machines. They are used to produce such products as toothpaste, chewing gum, textured soya proteins.

Ex. 3. Answer the questions.

1. For what purposes mixing is used in chemical industry? 2. How can the field of mixing be divided? 3. What are the main types of mixing devices? 4. What are the advantages of paddle stirrer? 5. For what purposes propeller stirrers are used? 6. What kind of equipment is used for mixing stiff materials? 7. What stirrers are used for mixing dry powders? 8. What is the main mixing element of the beater? 9. What materials are mixed in the beater? 10. What other types of mixers can you mention? 11. What operations have much in common?

Ex. 4. Identify an odd word.

1. Mixer – stirrer – blender – conditioner. 2. To be excess – to be needed – to be required – to be necessary. 3. Machine – device – equipment – bottom. 4. Expensive – compressed – cheap – affordable.

Ex. 5. Match the words with their definitions.

1) stirrer	a) to increase in rate, amount, or extent, to make something happen faster
2) to accelerate	b) tough elastic polymeric substance made from the latex of a tropical plant or synthetically
3) rubber	c) flat cutting edge of a knife, saw, or other tool
4) mixture	d) act of delaying or stopping it for a while or until a decision is made about it
5) blade	e) measurement of someone or something from head to foot or from base to top
6) to obtain	f) favorable condition or circumstance that may help you to succeed
7) direction	g) to get something
8) advantage	h) object or mechanical device used for mixing something
9) suspension	i) course along which someone or something moves
10) height	j) substance made by mixing other substances together

Ex. 6. Prove whether the following statements are true or false.

1. The field of mixing may be divided into four parts. 2. A paddle stirrer is one of the most complicated forms of mixing devices. 3. The cost of paddle stirrers is not very high. 4. Propeller stirrers are used to mix powders. 5. Kneading machines are usually not big in size. 6. The complete mixing of dry powders is an easy operation to perform. 7. Solids may be mixed by bubbling compressed air.

Ex. 7. Complete the sentences with the words from the table below.

amount, consist, direction, rubber, height, bottom, moderate, ribbon, require, bubble

1. A dangerous … of radioactivity was released after Chernobyl nuclear disaster. 2. They went away in opposite … . 3. New equipment is … for the conduction of this experiment. 4. She always wears a … in her hair. 5. Since she began a treatment there has been a … improvement in her health. 6. When water starts to boil, … rise to the surface. 7. He is a man of an average … . 8. This doll is made of … so a child will not break it. 9. This family … of a husband, a wife and two children. 10. Sign your name in at the … of the page.

Ex. 8. Complete each sentence using a word derivationally related to the word given in brackets.

1. The … of labour is the separation of tasks in any system so that participants may specialize (divide). 2. Steel … is one of traditional industries of the United Kingdom (produce). 3. Try to avoid foods which … a lot of fat (container). 4. They are trying to … the rules – some of them are too complicated and uneasy to understand (simple). 5. The police officer … traffic (direction). 6. Mr. Bright is responsible for road … in this city (construct). 7. We must … our efforts if we want to win (intensification).

Ex. 9. Put the words in the right order.

1. much / mixing / propeller / the / of / in / faster / stirrers / is / process. 2. machines / operating / are / sizes / and / capacities / built / have / kneading / large / in / may / large. 3. stirrer / mixing / simplest / is / devices / the / a / form / paddle / of. 4. difficult / mixing / to / powders / the / very / of / operation / dry / perform / is / complete. 5. towards / the / materials / blades / centre / of / induce / the / of / the / flow / the / the / drum. 6. mixed / by / liquids / be / bubbling / may / air / compressed. 7. move / necessary / the / forth / get / until / homogeneous / materials / and / we / mixture / the / continuously / back.

Ex. 10. Say it in English.

Широко используется, ускорять химические реакции, полное смешивание, различные виды смешивания, однородная смесь, полуцилиндрическое дно, мешалка с ленточной спиралью, большое количество, вращаться вокруг своей оси, широкое разнообразие.

Ex. 11. Complete the sentences using the information from the text.

1. Mixing is widely used in chemical industry for … . 2. The simplest form of mixing devices is … . 3. Paddle stirrers have a simple … . 4. The main part of the propeller stirrer is … . 5. Kneading machines are used for … . 6. Spiral ribbon stirrers are used … . 7. Beaters consist of … . 8. The process of mixing by compressed air is … . 9. A horizontally rotatable drum is constructed for … . 10. Complex compounding machines are used to produce … .

2.5. ENVIRONMENTAL POLLUTION

Ex. 1. Read and learn the following words.

Acid rain – кислотный дождь; behavior – поведение; benefit – выгода, польза; condition – условие, состояние; to contaminate – загрязнять, отравлять, портить; damage – вред, разрушение, ущерб; deforestation – вырубка леса; environment – окружающая среда; equipment – оборудование; greenhouse effect – парниковый эффект; overpopulation – перенаселенность; ozone depletion – истощение озонового слоя; pollution – загрязнение; recycling – переработка, повторное использование; responsibility – ответственность; surrounding – окружение.

Ex. 2. Read and translate the following text.

Environmental Pollution

Environment is everything that is around us. It is the surrounding of a living organism, including natural forces and other living beings, which provides conditions for development and growth as well as of danger and damage. There are different interactions between animals, plants, soil, water, and other living and non-living things – they constantly adapt themselves to conditions in their environment.

The natural environment is contrasted with the built environment, which comprises the areas and components that are strongly influenced by humans.

Since everything is part of the environment of something else, the word "environment" is used to talk about many things. Electromagnetic environment is radio waves and other electromagnetic radiation and magnetic fields. The galactic environment refers to conditions between the stars. In psychology and medicine a person's environment is not only surrounding places, but also other people, physical things and emotional state a person lives with. The environment affects the growth and development of the person. It influences the person's behavior, body and mind.

Speaking about environment in the most common understanding of this term, we may call it our planet – the Earth. Nature is the basis of it and now it is more and more dominated by mankind. People try to make the conditions of our living more comfortable, but very often the progress of our civilization causes damage to our planet. Our industries, transport, waste products contaminate water, soil and air, which results in harmful changes of our environment. Overpopulation, pollution and energy consumption have created such planet-wide problems as massive deforestation, ozone depletion, acid rains and the global warming that is believed to be caused by the greenhouse effect.

Environmental protection is a practice of protecting the natural environment on individual, organization controlled on governmental levels, for the benefit of both the environment and mankind. Since the 1960s, activity of environmental movements has created awareness of the various environmental problems. Now there are many green organizations in the world that try to promote the idea of people's responsibility for our planet. World governments pass laws that limit a damaging influence of factories and plants by installing environmentally friendly equipment and introducing new ways of recycling. Environmental chemistry and green chemistry develop rapidly in order to discover new kinds of fuel, technologies and devices that would be less damaging for the environment.

We should always remember that the Earth is our home and it should be protected for a better life in future.

Ex. 3. Answer the questions.

1. What is environment? 2. What meanings does the word "environment" have? 3. What changes occur in environment nowadays? 4. What are the major examples of environmental pollution? 5. What is environmental protection? 6. What people do to hold back various damaging consequences of human activity? 7. Why it is important to protect our environment?

Ex. 4. Identify an odd word.

1. People – pollution – mankind – humanity. 2. Global – universal – local – world – wide. 3. Factories – works – plants – damage. 4. Device – technology – equipment – organization.

Ex. 5. Match the words with their definitions.

1) adapt	a) action of using up a resource
2) consumption	b) power to have an effect on people, things or situations
3) greenhouse effect	
4) pollution	c) to keep someone or something safe from injury, damage, or loss
5) to protect	
6) influence	d) cutting down of trees in a large area, or the destruction of forests by people
7) deforestation	
8) fuel	e) material used to produce heat or power by burning
9) condition	
10) interaction	f) occasion when two or more people or things communicate with or react to each other
	g) state of something with regard to its appearance, quality, or working order
	h) damage caused to water, air, etc. by harmful substances or waste
	i) warming that results when solar radiation is trapped by the atmosphere
	j) to change something to suit different conditions or uses

Ex. 6. Prove whether the following statements are true or false.

1. The word "environment" may only refer to nature. 2. The natural environment and the built environment exist in harmony today. 3. Overpopulation is the major factor that causes environmental problems to appear. 4. People started to pay attention to environmental protection only about thirty years ago. 5. World governments do not pay attention to environmental pollution. 6. We cannot do anything to protect our planet from the damaging consequences of our civilization. 7. Green chemistry is a field of science that aims at learning the structure of plants.

Ex. 7. Complete the sentences with the words from the table below.

damage, responsibility, soil, to pollute, to influence, awareness, recycle, condition, danger, consumption

1. This … was poisoned by radiation, so it cannot be used for agriculture. 2. Household water … slightly decreased during the 1990s. 3. The Japanese … more than half their waste paper. 4. These symptoms are not specific for pollution … . 5. You should take you … very seriously – do not forget that you make the final decision. 6. These buildings are in poor … . 7. Environmental … has increased dramatically in recent years. 8. I believe these facts can … your decision. 9. It has become economically unprofitable for the State to … the environment. 10. The doctor say he is out of … and may return home soon.

Ex. 8. Complete each sentence using a word derivationally related to the word given in brackets.

1. World Wildlife Fund is a popular … organization that aims at protection of rare species of animals (environment). 2. About 34 % of … research that take place in our country are connected with environmental protection (science). 3. This plant is known for its … effects and have been used medicinally for centuries (benefit). 4. The … was made by a group of Norwegian scientists (discover). 5. Public pressure to … the environment is strong and growing (protection). 6. Evolution occurs as a result of … to new environment (adapt). 7. The heavy metal … was registered in this area (contaminate).

Ex. 9. Put the words in the right order.

1. danger / for / growth / and / as / development / damage / well / and / conditions / provides / as / environment / of. 2. environment / the / natural / built / is / with / environment / the / contrasted. 3. development / affects / and / the / person / the / of / the / environment / growth. 4. living / our / damage / often / make / the / civilization / planet / conditions / but / to / progress / people / of / the / very / more / the / comfortable / try / of / our / causes / to / our. 5. many / overpopulation / and / energy / have / problems / planet-wide / pollution / consumption / created. 6. develop / green / rapidly / environmental / chemistry / nowadays / and / chemistry. 7. practice / protecting / of / the / the / environmental / mankind / a / both / and / environment / is / benefit / the / of / environment / protection / natural / for.

Ex. 10. Say it in English.

Живые существа, условия для развития и роста, различные взаимодействия, постоянно приспосабливаются, магнитное поле, наносить ущерб, проблемы планетарного масштаба, движение в защиту окружающей среды, устанавливать оборудование, экологически безопасный, новые виды топлива.

Ex. 11. Complete the sentences using the information from the text.

1. Environment is the surrounding of … . 2. There are different interactions between … . 3. The natural environment is contrasted with … . 4. The environment affects … . 5. Overpopulation, pollution and energy consumption have … . 6. Environmental protection is … . 7. There are many green organizations in the world that … .

GRAMMAR TEST ON MODULE 2

Note! Before performing the following exercises, it is recommended to repeat modal verbs and their equivalents, tenses, types of questions, passive voice.

1. Use *can* or *can't*.

1. You … speak aloud in the library. 2. Ann … use my dictionary. 3. Students … bring pet animals to the reading-hall. 4. You … have a look at my paper if you like. 5. Drivers … leave their cars in a no-parking zone. 6. You … swim across the river in this place, it's extremely dangerous. 7. The law says you … drive a car without a seat-belt. 8. Jack asked me to lunch next Saturday. … I come? 9. Tom, you … take my car tonight, I'm not using it.

2. Change the sentences below using *may*.

1. Do you permit her to go home for a few days? 2. Allow me to do things the way I want to do them. 3. Are little children allowed to play with matches? 4. Let me join you in your trip to Paris? 5. Do you permit you them to attend your lectures? 6. Allow me to use your dictionary. 7. Let me take your umbrella. It's raining hard. 8. Will you allow the children to go to the river with us? 9. Let Bob play chess after he finishes his homework. 10. Let him speak to you in private.

3. Change the sentences below using *must*.

1. Is it necessary for you to explain your choice? 2. Is it necessary for us to read the text? 3. Is it necessary for me to do it now? 4. Is it necessary for us to invite her tonight? 5. Is it necessary for her to consult the doctor? 6. Is it necessary for them to meet her? 7. Is it necessary for me to leave at once? 8. Is it necessary for him to speak to the Dean? 9. Is it necessary for me to go to the meeting? 10. Is it necessary for you to visit him there?

4. Replace model verbs in the sentences below with their equivalents: *have to, be to, should, ought to, need*.

1. The stranger couldn't explain anything. 2. Your child must not stay at home alone. 3. Can you solve this problem? 4. You may take any picture. 5. Couldn't you run this distance more quickly? 6. The operators might work in our lab. 7. Who can translate this text? 8. They must attend all lectures. 9. May I go to the cinema tomorrow? 10. We must meet at 9 o'clock. 11. Can Ann's parents help her?

5. Complete the sentences using *have to, should, ought to*.

1. He is seriously ill now … . 2. I had much work to do … . 3. I'm afraid it's going to rain … . 4. It's getting late … . 5. He's lost my book … . 6. Do you think we … ? 7. It was a mistake to have come. I … . 8. I don't think I … . 9. I think there are many things we … . 10. Your eyesight is poor. You … .

6. Rewrite these sentences using *be to*, *need*.

1. There is no need for you to be present. 2. They plan to take their examinations in June. 3. He promised to come tonight. 4. Do you expect me to believe that he was not blame? 5. I expect her to come by the first train. 6. It is not necessary to go there. 7. It was not necessary for mother to cook this dinner. 8. There was no necessary for her to do it herself. 9. What am I expected to say to that? 6. She says she will make the dress tomorrow. 10. We were told to finish our work in a week but we could not do it. 11. He plans to get in touch with me.

7. Read the text and choose the best tense form from 1–4. Put 3 types of questions to the text.

I walked out along the bridge. The water (1) … past about forty meters below. I (2) … a little nervous but now I felt sick. Perhaps doing a bungee jump had been a bad idea. "If you (3) … it, you'll regret it for the rest of your life," said the instructor. "In no more than two minutes you (4) … your first jump and you'll be a hero," she continued. "If you (5) … any doubts, you shouldn't have come up here," said my friend Andrew, who was already putting his belt on. I watched Andrew disappear over the side of the bridge. I (6) … worrying about the jump. Now I (7) … by the fear of failure. Not only were there people watching below, but Andrew (8) … his jump. "They (9) … for you next," said the instructor. Never have I felt such fear as when I stepped off the bridge, and seldom (10) … so happy when something was over. That was my first and last bungee jump.

1. 1) was rushing; 2) had been rushed; 3) was being rushed; 4) has been rushing; 2. 1) was felt; 2) had been feeling; 3) had been felt; 4) have felt; 3. 1) don't do; 2) won't be doing; 3) haven't done; 4) didn't do; 4. 1) complete; 2) will be completed; 3) have been completed; 4) will have completed; 5. 1) have been had; 2) were had; 3) had; 4) are having; 6. 1) had stopped; 2) will stop; 3) have stopped; 4) was stopped; 7. 1) has been gripped; 2) was gripping; 3) had been gripped; 4) was gripped; 8. 1) would already do; 2) was already done; 3) has already been doing; 4) had already done; 9. 1) will all be cheered; 2) would all cheer; 3) will all be cheering; 4) have all been cheered; 10. 1) will I be; 2) I had been; 3) I was; 4) have I been.

8. Complete the sentences using either *Present Simple* or *Present Continuous.*

1. Who is that man? What … he (want)? 2. Who is that man? Why … he (look) at us? 3. … you (believe) in God? 4. Gilbert says he is 20, but nobody (believe) him. 5. Every Monday Jane (drive) her kids to football practice. 6. Be quiet. Paul (sleep). 7. Don't forget to take your umbrella. It (rain). 8. I don't like living in England. It always (rain). 9. Look! It (snow). We are going to have a white Christmas. 10. Mary (watch) TV every morning.

9. Complete the sentences using either *Present Perfect* or *Present Perfect Continuous*.

1. Peter: You (telephone) for ages. You not nearly (finish)? Jack: I (not get) through yet. I (try) to get our Paris office but the line (be) engaged all morning. 2. Ann (fail) her driving test three times because she's so bad at reversing. But she (practice) reversing for the last week and I think she (get) a bit better at it. 3. Tom: I often (wonder) why Bill left the country so suddenly. Peter: Actually, I just (find) out. 4. He (play) the bagpipes since six o'clock this morning. He only just (stop). 5. Why you (not bring) me the letters for signature? You (not type) them yet? 6. Tom (lo Tuesday evening. 7. He is expected to join us at the railway station at 5 p.m.

10. Put the verb in brackets into the correct form: *Past Simple* or *Past Continuous.*

1. Elena (wait) for me when I (arrive). 2. "What (you / do) this time yesterday?" I was asleep. 3. "(you / go) out last night?" "No, I was too tired." 4. "Was Elizabeth at the party last night?" "Yes, she (wear) a really nice dress." 5. How fast (you / drive) when the accident (happen)?

6. Damian (take) a photograph of me while I (not / look). 7. We were in a very difficult position. We (not / know) what to do. 8. I haven't seen Peter for ages. When I last (see) him, he (try) to find a job in London.

11. Put the verbs in brackets into the correct tense: *Past Simple* or *Present Perfect*.

1. I (buy) a new house last year, but I (not sell) my old house yet, so at the moment I have two houses. 2. When Ann (be) on her way to the station it (begin) to rain. Ann (run) back to her flat for her umbrella, but this (make) her late for her train. 3. She (catch) the next train but it (not get) in till 9.00, so she (arrive) at her office ten minutes late. 4. Her boss (look) up as she (come) in. "You (be) late every morning this week," he (growl). 5. At 7 a.m. Charles (ring) me and (say), "I'm going fishing. Would you like to come?" "But it's so early," (say) I. I (not have) breakfast yet. Why you (not tell) me last night?"

12. Put the verbs in brackets into the correct tense: *Past Simple* or *Past Perfect*. Make them negative.

1. After Al (spend) his holiday in Spain he (want) to learn Japanese. 2. Mary (phone) Marta at work before she (leave) for her trip. 3. Karl (turn on) the TV after he (wash) the dishes. 4. When he (arrive) the match already (start). 5. After Lilia (come) home he (feed) the cat. 6. Before he (sing) a song he (play) the guitar. 7. He (watch) a video after the children (go) to bed. 8. After Maxim (make) breakfast he (phone) his friend. 9. I (be) very tired because I (study) too much.

13. Complete the sentences with *Future Simple, Present Simple*, or *Present Continuous for Future*.

1. The train (will arrive / is arriving / arrive / arrives) at 11:00. 2. I (am gone / am going / is going / will) to call you tomorrow. 3. John (come / comes / is coming / was coming) to London next week. 4. When (do … flying / is … flying / does … flies / does … fly) the plane … ? 5. Mary (was / is going / go / will) to pass the am. 6. According to schedule the bus (will come / comes / come / came) in an hour. 7. (Is you going / You going / Are you going / Will you) to buy some fruit? 8. How many tickets (are he going / he going / is he going / he is going) to buy?

14. Put the verbs into the correct form: *will* or *going to*.

1. It (rain). 2. They (eat) pasta. 3. I (wear) black shoes tonight. 4. They (not / help) you. 5. He (not / walk) home. 6. (cook / you) lunch? 7. She (share / not) his biscuits. 8. (leave / she) the house?

9. (take part / he) in the contest? 10. We (not / spend) my holiday abroad this year.

15. Rewrite the following sentences in the passive. Put questions to them.

1. Somebody sent me a bunch of flowers. 2. The man from the flower shop delivered them to my house. 3. He told me that they were a present. 4. A young man had ordered them. 5. He hadn't put any card in the flowers. I still don't know who sent them. 6. Someone started a fire in the Courtney National Park early yesterday morning. 7. They had used a match and some petrol to start the fire. 8. The fire had burnt a lot of trees before someone called the fire brigade.

16. Complete the sentences with the correct passive or active form of the following verbs: *discover*; *assassinate*; *become*; *build*; *climb*; *declare*; *destroy*; *elect*; *release*; *identify.*

1. The tomb of Tutanhamum … in the Valley of the Kings, Egypt. 2. US and French scientists … the AIDS virus. 3. A wall … between East and West Germany. 4. Edmund Hillari and Tenzing Norgay … Mount Everest. 5. The Titanic … after hitting an iceberg in the North Atlantic. 6. Nelson Mandela … from prison. 7. Mahatma Gandhi … by a terrorist. 8. Margaret Thatcher, the UK's first female prime minister, … . 9. The UK and France … war on Germany.

17. Correct the mistakes.

1. The dishes has been washed. 2. The letter are being opened every morning in the office. 3. Your homework must finished by Monday. 4. The woman seen taking the children to school. 5. Mike has been tell about the new job. 6. The cars stole from the car park. 7. The house is been decorated recently. 8. The center will visit by the King next month.

TEXTS AND EXERCISES FOR THE 3d TERM

3.1. CHEMISTRY

Ex. 1. Read and memorize the following words.

To break down – разрушать; to change – изменение, менять; composition – состав; compound – соединение; consist of – состоять из; density – плотность; determine – определять; substance – вещество; to include – включать; to involve – включать; liquid – жидкий; matter – вещество, материя; obtain – получать; processing – обработка; property – свойство; pure – чистый; raw material – сырье; relationship – взаимосвязь; solid – твердый; solubility – растворимость; subject (n) – предмет; to subject (v) – подвергать; to treat – обрабатывать; treatment – обработка; e.g. – for example – например; for this reason – по этой причине; both … and … – как …, так и …; either … or … – или … или; in order to – для того чтобы; i.e. – that is – то есть.

Ex. 2. Read and translate the text.

Chemistry

Chemistry is the science of substances, their properties and their changes. It studies the composition and structure of substances, the relationship between the properties of substances and their chemical composition and structure, the conditions and methods of their changes and transformations.

Chemical changes of substances are called chemical reactions. A chemical change involves changes in composition and in properties. A physical change involves only changes in properties with no change in composition. Chemical changes are always accompanied by some physical changes, e.g. by the liberation or the absorption of energy in the form of light, heat or electricity. For this reason chemistry is closely related to physics. The problems common both to chemistry and physics form the subject of special sciences – physical chemistry and chemical physics.

Chemistry is also closely related to other natural sciences, especially to biology, since any process in a living organism is accompa-

nied by continuous chemical changes of substances in that organism. We could add many other areas of study to the list: medicine, agriculture, oceanography, engineering, mathematics, etc.

All forms of matter consist of either pure substances or mixtures of two or more pure substances. Elements are the building blocks of matter. Compounds are combinations of elements. The formation of a compound from simpler substances is known as synthesis. Analysis is the process of breaking down a compound into simpler substances or its elements and thus is the determination of its composition. The composition of a pure substance never changes.

Every substance has physical and chemical properties. Physical properties include color, smell, solubility, density, hardness and boiling and melting points. Chemical properties include the behavior with other materials.

Matter exists in three states: the solid, the liquid and the gaseous state. A substance usually can be transformed from one state to another under the changes of its temperature.

Chemistry plays a very important part in modern life, especially in man's industrial activities, since almost all branches of industry are connected with some application of chemistry.

Nature gives us various raw materials, e.g. wood, coal, ore, oil, etc. We subject these natural raw materials to chemical treatment and obtain various substances with different physical and chemical properties. Then we use these substances in agriculture, e.g. mineral fertilizers, in industry for the manufacture of various industrial products, e.g. steel, plastics and in everyday life, e.g. soap, soda, medicines, etc.

In order to manufacture useful things it is often necessary to treat natural raw materials chemically, i.e. to subject them to chemical processing. To do this successfully we are to learn the general laws of changes and transformations of substances, and it is chemistry that gives us this knowledge. Metals, glass, plastics, dyes, drugs, insecticides, paints, paper, soaps, detergents, explosives and perfumes are all made of chemicals.

Ex. 3. Answer the questions.

1. What does chemistry study? 2. What is a chemical reaction? 3. What does a chemical change involve? 4. Does a physical change involve changes in composition? 5. What sciences is chemistry closely related to? 6. Analysis is the process of breaking down a compound into simpler substances, isn't it? 7. What are physical properties of

a substance? 8. What are the three states of matter? 9. Why must we learn the general laws of chemistry? 10. What things are manufactured from chemicals?

Ex. 4. Identify an odd word.

1. Chemistry, physics, mathematics, linguistics, biology. 2. Structure, plastics, composition, property, ingredient. 3. Solid, liquid, difficult, gaseous, volatile. 4. Paint, paper, soap, wood, perfume, plastics.

Ex. 5. Match the words with their definitions.

1) substance	a) the production of a substance from simpler materials after chemical reaction
2) property	b) the act or process of preparing something by a special method
3) raw material	c) a particular kind of matter with uniform properties
4) mixture	d) the temperature at which a solid substance melts
5) synthesis	e) the basic material from which a product is made
6) melting point	f) quality or characteristic of something
7) processing	g) a substance made by mixing other substances together

Ex. 6. Say whether the following statements are true or false.

1. Chemistry is the science of substances, their properties and their changes. 2. A physical change involves changes in composition and in properties. 3. Chemistry studies societies and human behavior. 4. Chemical changes of substances are called chemical reactions. 5. Chemical changes are accompanied by some physical changes. 6. The forms of energy are light, heat and electricity. 7. Analysis is the formation of a compound from simpler substances. 8. Matter exists in two states: the solid and the gaseous state. 9. Every substance has physical and chemical properties. 10. The building blocks of matter are bricks.

Ex. 7. Complete the sentences with the words from the table below.

pure, properties, composition, raw materials, plays, changes, living organism, physical, compounds, analysis

1. Chemistry studies chemical … and structure of substances. 2. Chemical … of substances are called chemical reactions. 3. Chemical changes of substances are accompanies by … changes. 4. Any process in a … … is accompanied by changes of substances. 5. All forms of matter consist of … substances or mixtures. 6. … are combinations of elements. 7. … is the process of breaking down a compound into

simpler substances. 8. Chemical … include the behavior with other materials. 9. Chemistry … a very important part in modern life. 10. Nature gives us various … .

Ex. 8. Complete the sentences with the words derivationally related to the words in brackets.

1. Chemistry studies the composition and … of substances (structural). 2. A chemical change … changes in composition and in properties (involvement). 3. Chemical changes are accompanied by the liberation or … of energy (absorb). 4. Chemistry is closely related to other … sciences (nature). 5. All … of matter consist of pure substances or mixtures (formation). 6. The composition of a pure substance never … (changeable). 7. A substance usually can be … from one state to another (transformation). 8. Nature gives us … raw materials (vary).

Ex. 9. Put the words in the right order.

1. properties / relationship / substances / chemistry / the / the / studies / between of. 2. only / a / changes / properties / involves / in / change / physical. 3. are / liberation / by / chemical / the / changes / of / or / energy / accompanied / absorption / the. 4. closely / to / is / biology / related chemistry. 5. the / matter / are / blocks / building / elements / of. 6. combinations / elements / are / of / compounds. 7. include / with / the / chemical / materials / other / properties / behavior. 8. very / modern / in / chemistry / life / a / important plays / part.

Ex. 10. Say it in English.

Вещество, состав, изменение, включать, свойство, сопровождать, естественные науки, соединение, точка кипения, химическая обработка.

Ex. 11. Complete the sentences using the information from the text.

1. Chemistry studies the composition and structure of … . 2. The problems common both to chemistry and physics form the subject of special … . 3. Any process in a living organism is accompanied by continuous chemical … . 4. The formation of a compound from simpler substances is known as … . 5. Every substance has physical and chemical … . 6. A substance can be transformed from one state to another under the changes of its … . 7. Almost all branches of industry are connected with some application of … . 8. In order to manufacture useful things it is necessary to subject natural raw materials to chemical … .

3.2. ENGINEERING

Ex. 1. Read and memorize the following words.

Broadcast engineering – радиовещательная техника; circuit – схема; civil engineering – гражданское строительство; to design – проектировать; device – устройство; electrical engineering – электротехника; engineering – техника, инженерное искусство; to invent – изобретать; to give rise to – привести к; lighthouse – маяк; machine-tool – станок; mechanical engineering – машиностроение; operation – разработка; power and energy system – энергосистема; powertrain – силовая установка, трансмиссия; public works – общественные сооружения; structural engineering – проектирование зданий, сооружений; surveying – инженерно-изыскательские работы; to train – обучать; water supply – водоснабжение; in order to – для того чтобы; responsible for – ответственный за; while – в то время как.

Ex. 2. Read and translate the text.

Engineering

Engineering is the application of scientific knowledge and mathematical methods to practical purposes of the design, construction or operation of structures, machines or systems. Engineering had existed since ancient times, when humans invented such tools as the wedge, lever, wheel and pulley.

The term *engineering* is derived from the word *engineer*, which dates back to 1390 when an engineer (one who operates an *engine*) referred to *a constructor of military engines*. The word "engine" itself is of even older origin, derived from the Latin *ingenium*, meaning "innate quality, especially mental power, hence a clever invention".

Engineering is a broad discipline which is often divided into several sub-disciplines. Although an engineer is usually trained in a specific discipline, he or she may become multi-disciplined through experience. Engineering has four main branches: chemical engineering, civil engineering, electrical engineering, and mechanical engineering.

Chemical engineering developed in the late nineteenth century. Industrial manufacture demanded new materials and new processes and by 1880 the need for large scale production of chemicals was such that a new industry was created, dedicated to the development and large scale manufacturing of chemicals in new industrial plants. The role of the chemical engineer was the design of these chemical plants and pro-

cesses. Chemical engineering is the application of physics, chemistry, biology, and engineering principles in order to carry out chemical processes on a commercial scale, such as petroleum refining, microfabrication, fermentation, and biomolecule production.

Civil engineering is the design and construction of public and private works, such as infrastructure (airports, roads, railways, water supply, etc.), bridges, tunnels, dams, and buildings. Civil engineering is traditionally divided into a number of sub-disciplines, including structural engineering, environmental engineering, and surveying. John Smeaton is often regarded as the "father" of civil engineering. He was an English civil engineer responsible for the design of bridges, canals, harbors, and lighthouses.

The foundations of electrical engineering in the 1800s included the experiments of Alessandro Volta, Michael Faraday, Georg Ohm and others and the invention of the electric telegraph in 1816 and the electric motor in 1872. Electrical engineering is the design, study and manufacture of various electrical and electronic systems, such as Broadcast engineering, electrical circuits, generators, motors, electromagnetic/electromechanical devices, electronic devices, electronic circuits, optical fibres, optoelectronic devices, computer systems, telecommunications, instrumentation, controls and electronics.

The inventions of Thomas Newcomen and James Watt gave rise to modern mechanical engineering. The development of specialized machines and machine tools during the industrial revolution led to the rapid growth of mechanical engineering. Mechanical engineering is the design and manufacture of physical and mechanical systems, such as power and energy systems of aircraft products, weapon systems, transportation products, engines, compressors, powertrains, kinematic chains, vacuum technology, vibration isolation equipment, manufacturing, and mechatronics.

The theoretical work of James Maxwell and Heinrich Hertz in the late 19th century gave rise to the field of electronics. Aeronautical engineering deals with aircraft design while aerospace engineering is a more modern term including spacecraft design.

Ex. 3. Answer the questions.

1. What is engineering? 2. What is the origin of the term engineering? 3. What are four main branches of engineering? 4. When did chemical engineering develop? 5. What was the role of the chemical engineer? 6. What does infrastructure include? 7. What are sub-disciplines

of civil engineering? 8. When were the foundations of electrical engineering laid? 9. What does mechanical engineering deal with? 10. What branch of engineering deals with spacecraft design?

Ex. 4. Identify an odd word.

1. Design, construction, operation, legislation, invention. 2. Wedge, lever, school, wheel, pulley, engine. 3. Chemical, civil, wonderful, electrical, mechanical, aeronautical. 4. Petroleum refining, translation, microfabrication, fermentation, biomolecule production, ionization.

Ex. 5. Match the words with their definitions.

1) invent	a) substance produced by or used in a chemical process
2) engine	b) tower or other structure with a powerful light that gives signals to navigators
3) chemical	c) create or design something that has not existed before
4) biology	d) machine with moving parts that converts power into motion
5) fermentation	e) aeroplane, helicopter or other machine capable of flight
6) lighthouse	f) study of living organisms and vital processes
7) aircraft	g) chemical breakdown of a substance by bacteria, yeasts or other microorganisms

Ex. 6. Say whether the following statements are true or false.

1. The term engineering is derived from the word engine. 2. Engineering covers a very narrow field of knowledge. 3. Chemical engineering developed in the 18th century. 4. The role of the chemical engineer was the design of chemical plants and processes. 5. Engineering has four main branches. 6. Chemical engineering is the application of engineering principles in order to carry out chemical processes. 7. Michael Faraday is often regarded as the "father" of civil engineering. 8. Civil engineering is divided into a number of sub-disciplines. 9. The electric telegraph was invented in 1816. 10. The theoretical work of J. Maxwell and H. Hertz gave rise to the field of aeronautics.

Ex. 7. Complete the sentences with the words from the table below.

discipline, principles, engine, aerospace, application, foundations, manufacture, engineer

1. Engineering is the … of scientific knowledge and mathematical methods to practical purposes. 2. The word … is derived from the Latin *ingenium*. 3. Engineering is a broad … which is divided into several

sub-disciplines. 4. Industrial … demanded new materials and new processes. 5. Chemical engineering is the application of engineering … to carry out chemical processes. 6. He was an English civil … responsible for the design of bridges, canals, harbors, etc. 7. The … of electrical engineering included the experiments of Alessandro Volta, Michael Faraday, Georg Ohm and others. 8. Aerospace engineering includes … design.

Ex. 8. Complete the sentences with the words derivationally related to the words in brackets.

1. Engineering had existed since ancient times when humans … such tools as the wedge, lever, etc. (invention). 2. … has four main branches (engineer). 3. Chemical engineering … in the late 19th century (development). 4. Civil engineering is the design and … of public and private works (construct). 5. Civil engineering is … into a number of sub-disciplines (division). 6. The inventions of T. Newcomen and J. Watt gave rise to modern … engineering (mechanics). 7. Electrical engineering includes the manufacture of various … and electronic systems (electricity).

Ex. 9. Put the words in the right order.

1. derived / term / word / is the / engineer / the / from / engineering. 2. trained / a / specific / engineer / in / discipline / an / is / usually. 3. demanded / industrial / 19th / materials / in / manufacture / late / new / the / century. 4. new / industry / created / by / was / 1880 / chemical / a. 5. and / includes / engineering / structural / civil / environmental / engineering / surveying / engineering. 6. bridges / for / J. Smeaton / of / was / design / responsible / harbors / the / canals. 7. invented / motor / in the / 1872 / electric / was. 8. the / systems / engineering / physical / mechanical / of / mechanical / is / and / design / and / manufacture.

Ex. 10. Say it in English.

Техника, двигатель, гражданское строительство, развивать, изобретение, производство, проект, химический процесс, брожение, строительство, электрическая схема, станок, энергосистема, вакуумная технология, прибор.

Ex. 11. Complete the sentences using the information from the text.

1. Engineering is the application of scientific knowledge and mathematical methods to practical … . 2. Engineering is often divided into several … . 3. Chemical industry of the 19th century was dedicated to the development and manufacture of … . 4. Chemical engineering is the supplication of physics, chemistry and biology to carry out chemical … .

5. J. Smeaton is often regarded as the "father" of civil … . 6. The foundations of electrical engineering in the 1800s included the invention of electric … . 7. Mechanical engineering is the design and manufacture of physical and mechanical … . 8. Aerospace engineering deals with spacecraft … .

3.3. AUTOMATION

Ex. 1. Read and memorize the following words.

To accommodate – приспосабливать; to accomplish – выполнять; to actuate – приводить в действие; batch – партия (деталей, продуктов); to cause – заставлять; changeover – переход (переключение); controls – средства контроля; to drive – управлять; to execute – выполнять; to fix – определять (устанавливать); fixed automation – автоматизация механическими средствами (фиксированная, жесткая автоматизация); flexible automation – гибкая автоматизация; to involve – включать; lead time – производственный цикл; low-volume production – мелкосерийное производство; machine tool – станок; machining operation – механическая обработка (станочная операция); material handling – погрузочно-разгрузочные работы, транспортирование материалов; lead time – производственный цикл; part – деталь; performance – работа/производительность; processing – обработка; programmable automation – автоматизация с применением программируемых устройств; provide – обеспечивать; safety monitoring – контроль безопасности; sequence – последовательность; to track – следить; in many cases – во многих случаях; i.e. – that is – то есть; that would otherwise be accomplished – которая в противном случае будет осуществляться; in attendance – в присутствии; safety monitoring capability – возможность мониторинга безопасности; with virtually no time lost – практически без потери времени.

Ex. 2. Read and translate the text.

Automation

Automation is the technology by which a process or procedure is accomplished without human assistance. It is done using a program of instructions combined with a control system. Although automation can be applied in a wide variety of areas, it is most closely associated with the manufacturing industries. An automated system consists of three

basic elements: 1) *power* to accomplish the process and operate the system; 2) a *program of instructions* to direct the process; and 3) a *control system* to actuate the instructions.

An automated system is used to operate some process, and power is required to drive the process. The principal source of power in automated systems is electricity. Alternative power sources include fossil fuels, solar energy, water, and wind. However, their exclusive use is rare in automated systems. In many cases when alternative power sources are used to drive the process itself, electrical power is used for the controls that automate the operation.

The actions performed by an automated process are defined by a program of instructions. Each part or product made in the operation requires one or more processing steps. These processing steps are performed during a work cycle. A new part (parts) is produced during each work cycle. The particular processing steps for the work cycle are specified in a work cycle program. The control element of the automated system executes the program of instructions. The control system causes the process to accomplish its defined function, i.e. to carry out some manufacturing operation.

An automated system is often installed to perform a potentially dangerous operation that would otherwise be accomplished manually by human workers. However, even in automated systems workers are still needed to service the system. It is important that the automated system be designed to operate safely when workers are in attendance. Thus, there are two reasons for providing an automated system with a safety monitoring capability: 1) to protect human workers involved in the system and 2) to protect the equipment associated with the system. Safety monitoring means more than the conventional safety measures. Safety monitoring in an automated system involves the use of sensors to track the system's operation and identify conditions and events that are unsafe or potentially unsafe. The safety monitoring system is programmed to respond to unsafe conditions in some appropriate way. Automated manufacturing systems can be classified into three basic types: fixed automation, programmable automation, flexible automation.

Fixed automation is a system in which the sequence of processing (or assembly) operations is fixed by the equipment configuration. In programmable automation, the production equipment is designed with the capability to change the sequence of operations to accommodate different product configuration. The operation sequence

is controlled by a program, which is a set of instructions coded so that they can be read and interpreted by the system. Programmable automated production systems are used in low- and medium-volume production. The parts or products are typically made in batches. Flexible automation is an extension of programmable automation. A flexible automated system is capable of producing a variety of parts (or products) with virtually no time lost for changeovers from one part style to the next.

Automated manufacturing systems perform operations such as processing, assembly, inspection, or material handling, in some cases accomplishing more than one of these operations in the same system. They are called automated because they perform their operations with a reduced level of human participation. In some highly automated systems, there is virtually no human participation. Examples of automated manufacturing systems include: automated machine tools that process parts; transfer lines that perform a series of machining operations; automated assembly systems; manufacturing systems that use industrial robots to perform processing or assembly operations; automatic material handling and storage systems to integrate manufacturing operations; automatic inspection systems for quality control.

Automation technology helps: to increase labor productivity; to reduce labor cost; to reduce or eliminate routine manual work; to improve worker safety; to improve product quality; to reduce manufacturing lead time; to accomplish processes that cannot be done manually, etc.

Ex. 3. Answer the questions.

1. How is automation accomplished? 2. What are three basic elements of automation? 3. What is it necessary in order to drive an automation system? 4. What are alternative sources of power? 5. What does a program of instructions define? 6. What is the function of a control system? 7. What is an automated system provided with to make it safe? 8. What are three basic types of automated manufacturing systems? 9. What is the difference between fixed automation and programmable automation systems? 10. What are advantages of automated systems?

Ex. 4. Identify an odd word.

1. Fossil fuel, machine tool, solar energy, water, wind. 2. Operation, processing, reason, work cycle, procedure, manufacture. 3. Come, accomplish, execute, actuate, drive, perform. 4. Processing, assembly, inspection, productivity, material handling.

Ex. 5. Match the words with their definitions.

1) manually	a) detailed information about how something should be done or operated
2) power	b) sequence of tasks, operations and processes that is repeated for each unit of work
3) fossil fuel	c) by hand rather than automatically or electronically
4) instruction	d) time between the initiation and completion of a production process
5) processing	e) short distance movement of goods or materials within a storage area involving loading, unloading, etc.
6) work cycle	f) series of mechanical or chemical operations in order to change or preserve
7) safety	g) energy for work
8) equipment	h) any organic material as coal, oil or natural gas formed in the earth from plant or animal remains
9) lead time	i) set of articles, tools, things, etc. for a particular purpose
10) material handling	j) condition of being protected from danger, risk or injury

Ex. 6. Say whether the following statements are true or false.

1. Automation is accomplished without human assistance. 2. Automation is closely associated with the manufacturing industries. 3. The principle source of power in automated systems is solar energy. 4. The control element in the automated system defines a program of instructions. 5. The safety monitoring system is programmed to carry out some manufacturing operations. 6. Safety monitoring means more than the conventional safety measures. 7. There are three types of automated systems: fixed automation, programmable automation and flexible automation. 8. In fixed automation the sequence of operations can be changed. 9. Processing operations are called automated because they are performed with a high level of human participation. 10. Automation technology helps to increase labor productivity.

Ex. 7. Complete the sentences with the words from the table below.

safety, workers, program, improve, drive, fixed, work, programmable, sensors, power

1. Automation is done using a … of instructions. 2. The principle source of … in automated systems is electricity. 3. Alternative power sources are used to … the process. 4. Processing steps are performed during a … cycle. 5. Even in automated systems … are needed to service the system. 6. There are two reasons for providing an automated system with a … monitoring capability. 7. Safety monitoring involves the use of … to track the system's operation. 8. … automation is a system in which the sequence of processing operations is fixed. 9. Flexible automation is an extension of … automation. 10. Automation technology helps to … worker safety.

Ex. 8. Complete the sentences with the words derivationally related to the words in brackets.

1. Automation can be applied in a … variety of areas (width). 2. Automated systems need … to accomplish the process and operate the system (powerful). 3. … power is used for the controls that automate the operation (electricity). 4. Processing steps are specified in a … cycle program (worker). 5. Automated systems often perform … operations (danger). 6. An automated system is designed to operate … (safe). 7. Safety monitoring system protects the … associated with the system (equip). 8. The … equipment is designed with the capability to change the sequence of operations (produce). 9. A flexible automated system is capable of producing a … of products (various). 10. They are called automated because they perform operations with reduced level of … participation (humanity).

Ex. 9. Put the words in the right order.

1. be / variety / automation / areas / in / can / of / wide / applied a. 2. system / basic / an / three / consists / automated / elements / of. 3. instructions / system / a / actuates / the / control. 4. required / to / the / process / power / drive / is. 5. wind / alternative / include / solar / power / energy / fuels / sources / fossil / etc. 6. produced / cycle / a / work / is / each / product / during / new. 7. element / instructions / controls / the / program / the / of executes. 8. are / automated / needed / even / systems / in / workers. 9. systems / there / basic / of / are / automated / three / types. 10. tools / automated / parts / process / machine.

Ex. 10. Say it in English.

Выполнять, применять, состоять из, мощность, рабочий цикл, вручную, контроль безопасности, защищать, оборудование, меры безопасности, гибкая автоматизация, последовательность, деталь, контроль качества, производительность труда.

Ex. 11. Complete the sentences using the information from the text.

1. Automation is accomplished without human … . 2. The particular processing steps are specified in a work cycle … . 3. It is important that the automated system is designed to operate … . 4. Safety monitoring means more than the conventional safety … . 5. Safety monitoring identifies conditions and events that are … . 6. In fixed automation the sequence of processing operations is fixed by the equipment … . 7. A set of instructions is coded so that they can be read and … . 8. A flexible automated system can produce parts with no time lost for … . 9. In some highly automated systems there is virtually no human … . 10. Automatic inspection systems are used for quality … .

3.4. BIOTECHNOLOGY

Ex. 1. Read and memorize the following words.

To address a problem – решать проблему; biodegradable – биоразлагаемый; bioleaching – биовыщелачивание руд; chemical – химическое вещество; to encompass – охватывать; environmental use – природоохранная цель; environmentally friendly – экологически безвредный; enzyme – фермент; to ferment – сбраживать, вызывать брожение; finishing – отделка; garment – одежда; intermediate – промежуточное химическое соединение (интермедиат); micropropagation – микроразмножение; to pretreat – предварительно обрабатывать; progressive selection – постепенный отбор; sewage treatment – очистка сточных вод; shrink resistance – устойчивость к усадке; waste – отходы; wrinkle resistance – несминаемость.

Ex. 2. Read and translate the text.

Biotechnology

Biotechnology (sometimes shortened to biotech) is a field of applied biology that uses living organisms and bioprocesses in engineering, technology, medicine and other fields. Biotechnology is one of the major technologies of the 21st century. The European Federation of Biotechnology (EFB) considers biotechnology as “the integration of natural sciences and organisms, cells, parts, and molecular analogues for products and services”. Biotechnology is not something new but represents a developing and expanding series of

technologies dating back thousands of years, when humans first began to use microbes to produce foods and beverages, such as bread and beer, and to modify plants and animals through progressive selection. Biotechnology encompasses many traditional processes, such as brewing, baking, winemaking, cheese production, and sewage treatment, where the use of microorganisms has been developed over countless years.

Biotechnology is based on pure biological sciences (genetics, microbiology, molecular biology, biochemistry, embryology, cell biology) and in many instances is also dependent on knowledge and methods from outside the sphere of biology (chemical engineering, bioprocess engineering, information technology, biorobotics).

Biotechnology has applications in four major industrial areas: health care, crop production and agriculture, non food (industrial) uses of crops and other products (biodegradable plastics, vegetable oil, biofuels) and environmental uses. For example, Biotechnology uses organisms for the manufacture of organic products. It also uses naturally present bacteria in bioleaching (mining industry). Biotechnology is used to recycle, treat waste, cleanup sites contaminated by industrial activities as well as to produce biological weapons.

Biotechnology can be classified into several branches.

Bioinformatics is an interdisciplinary field which addresses biological problems using computational techniques, and makes possible the rapid organization and analysis of biological data. It is also referred to as *computational biology*. Bioinformatics plays a key role in various areas, such as functional genomics, structural genomics, proteomics, and forms a key component in the biotechnology and pharmaceutical sector.

Blue biotechnology is a term that is used to describe the marine and aquatic applications of biotechnology.

Green biotechnology is biotechnology applied to agricultural processes. For example: selection and domestication of plants via micropropagation; designing of transgenic plants growing under specific environment in the presence (or absence) of chemicals. Green biotechnology might produce more environmentally friendly solutions than traditional industrial agriculture.

Red biotechnology is applied to medical processes. It is used to design organisms to produce antibiotics as well as to formulate genetic cures through genetic manipulation.

White biotechnology, also known as industrial biotechnology, is applied to industrial processes, e.g. designing of organisms to produce useful chemicals. White biotechnology tends to consume less of resources than traditional processes used to produce industrial goods.

Industrial biotechnology applies the techniques of modern molecular biology to improve the efficiency and reduce the influence of industrial processes on the environment. For example, industrial biotechnology companies develop biocatalysts, such as enzymes, to synthesize chemicals. Using biocatalysts, the same chemicals can be produced more economically and more environmentally friendly. Biotechnology is also used in the textile industry for the finishing of fabrics and garments. Biotechnology produces cotton that is warmer, stronger, has enhanced absorbency, and wrinkle- and shrink-resistance. Some agricultural crops, such as corn, can be used in place of petroleum to produce chemicals. The crop's sugar can be fermented to acid, which can be then used as an intermediate to produce other chemical raw material for various products.

Environmental biotechnology. Enzyme bioreactors pretreat industrial and food waste components and allow their removal. Waste can be converted to biofuel to run generators. Microbes are used to produce enzymes which convert plant and vegetable materials into building blocks for biodegradable plastics.

In medicine, biotechnology finds applications in such areas as drug production, pharmacogenomics, gene therapy and genetic testing.

Ex. 3. Answer the questions.

1. What is biotechnology according to the European Federation of Biotechnology? 2. What traditional processes are made using biotechnology techniques? 3. What other sciences is biotechnology closely related to? 4. What four major industrial areas is biotechnology used in? 5. How is biotechnology classified? 6. What is another name for bioinformatics? 7. What term is used to describe the marine and aquatic applications of biotechnology? 8. What is white biotechnology applied to? 9. What are the advantages of using biotechnology in industrial processes? 10. What areas of medicine is biotechnology used in?

Ex. 4. Identify an odd word.

1. Genetics, molecular biology, linguistics, biochemistry, microbiology. 2. Yellow, blue, white, red, green. 3. Selection, concentration, domestication, cultivation, breeding. 4. Gene therapy, drug production, bioleaching, genetic testing, pharmacogenomics.

Ex. 5. Match the words with their definitions.

1) medicine	a) relating to or found in the sea; existing in or produced by the sea
2) modify	b) unwanted or unusable material left over from a production process
3) microbe	c) chemical substance used in the treatment, cure, prevention or diagnosis of a disease
4) biorobotics	d) science of the diagnosis, treatment and prevention of disease
5) waste	e) process of bringing animals or plants under human control in order to provide food
6) bioleaching	f) transforming structure from its original form during development or evolution
7) marine	g) everything that is around us; it can be living or nonliving
8) domestication	h) microorganism, especially a bacterium causing disease or fermentation
9) environment	i) extraction of metals from their ores through the use of living organisms
10) drug	j) making robots which are able to simulate living bioorganisms

Ex. 6. Say whether the following statements are true or false.

1. Biotechnology is the use of antiseptics in engineering, technology, medicine and other fields. 2. Biotechnology is a new science of the 21st century. 3. Biotechnology encompasses such traditional processes as brewing, baking, cheese production, etc. 4. Biotechnology uses organisms for the manufacture of organic products. 5. Blue biotechnology is a term used to describe agricultural processes. 6. Red biotechnology is used to produce industrial goods. 7. Industrial biotechnology companies develop biocatalysts to synthesize chemicals. 8. Enzyme bioreactors pretreat industrial and food waste components. 9. Industrial biotechnology reduces the influence of industrial processes on the environment. 10. Bioinformatics forms a key component of biotechnology and pharmaceutical sector.

Ex. 7. Complete the sentences with the words from the table below.

organisms, aquatic, waste, field, biological, produce, solutions, biotechnology, efficiency, technologies

1. Biotechnology is a … of applied biology. 2. Biotechnology represents a series of … dating back to thousands of years. 3. Biotechnology uses … for the manufacture of organic products. 4. Bioinformatics addresses … problems using computational techniques. 5. Blue biotechnology describes the marine and … applications of technology. 6. Green biotechnology produces more environmentally friendly … than traditional agriculture. 7. White … is used to design organisms for the production of chemicals. 8. Industrial biotechnology is aimed at improving the … of industrial processes. 9. Enzyme bioreactors pretreat industrial and food … components. 10. Microbes are used to … enzymes.

Ex. 8. Complete the sentences with the words derivationally related to the words in brackets.

1. Biotechnology is considered to be the integration of … sciences and organisms (nature). 2. Humans first began to use microbes to … foods and beverages thousands of years ago (production). 3. Biotechnology is based on pure … sciences (biology). 4. Biotechnology has … in four major industrial areas (apply). 5. Bioinformatics makes possible the rapid organization and … of biological data (analytical). 6. Green biotechnology applies to … processes (agriculture). 7. Using biocatalysts the same chemicals can be produced more … friendly (environment). 8. The crop's sugar can be … to acid which is then used as an intermediate for the production of various products (fermentation). 9. Microbes are used to convert plant and … materials into building blocks for biodegradable plastics (vegetation). 10. Biotechnology uses … organisms in engineering, technology, medicine, and etc. (live).

Ex. 9. Put the words in the right order.

1. beverages / began / foods / humans / thousands / microbes / to and / ago / use / of / produce / to / years / first. 2. the / is / of / on / biotechnology / outside / dependent / biology / methods / and / sphere / from / knowledge. 3. encompasses / processes / many / biotechnology / traditional. 4. as / also / biology / biotechnology / to / computational / referred / is. 5. plants / is / green / transgenic / for / biotechnology / of / designing / applied.

Ex. 10. Say it in English.

Живой организм, производить, модифицировать, растение, очистка сточных вод, биологическая проблема, применение биотехнологии, одомашнивание растений и животных, окружающая среда, химикаты, фермент, сырье, превращать, биотопливо, растительные материалы, сельскохозяйственные культуры.

Ex. 11. Complete the sentences using the information from the text.

1. Biotechnology represents a developing and expanding series of … . 2. Thousands of years ago humans used microbes to produce … . 3. Humans used microbes to modify plants and … . 4. Biotechnology has applications in four major industrial … . 5. Biotechnology is used to recycle, treat, waste and cleanup sites contaminated by industrial … . 6. Bioinformatics makes possible the rapid organization and analysis of biological … . 7. White biotechnology tends to consume less of resources than traditional … . 8. Biocatalysts help to produce more environmentally friendly … . 9. Biotechnology is used in the textile industry for the finishing of fabrics and … . 10. Microbes are used to produce … .

3.5. COMPOSITE MATERIALS

Ex. 1. Read and memorize the following words.

Additive – добавка; binder – вяжущий материал; bonding – связывание; carbon – углерод; cermet – металлокерамика; coating – покрытие; compression strength – прочность на сжатие; dispersive composite – дисперсионный композиционный материал; ductile – вязкий, ковкий; fibre – волокно; filler – наполнитель; to formulate – составлять; malleable – ковкий; matrix – матрица; oriented – упорядоченный; particle/particulate – частица; particulate composite – композиционный материал с порошковым наполнителем; performance parameter – рабочая характеристика; processing/treatment – обработка; reinforcement – армирование, укрепление; strength – прочность; tough – прочный, упругий; wear resistance – износостойкость; workability – обрабатываемость.

Ex. 2. Read and translate the text.

Composite Materials

Composites are created by synthetic assembly of two or more materials to obtain specific characteristics and properties. A composite material is composed of a matrix, i.e. a continuous phase, and reinforcement, which is usually the discontinuous phase. The reinforcing material and the matrix material can be metal, ceramic, or polymer. The properties of composites are superior to the properties of their components. Three types of composites are: particle-reinforced composites, fibre reinforced composites, structural composites.

Typically, reinforcing materials are characterized by strength, low density, while the matrix is usually ductile or tough. If the composite is designed and fabricated correctly, it combines the strength of the reinforcement with the toughness of the matrix to achieve a combination of desirable properties not available in any single conventional material. The disadvantage is that such composites are often more expensive than conventional materials.

The strength of the composite depends on the amount, arrangement and type of fibre (or particle) reinforcement. Typically, the higher the reinforcement content, the greater is the strength. In some cases, glass fibres are combined with other fibres, such as carbon, to create a "hybrid" composite that combines the properties of more than one reinforcing material. In addition, the composite is often formulated with fillers and additives that change processing or performance parameters. According to the structure or geometry of the reinforcement there are dispersive composites – contain very fine particles, dispersion; particulate composites (particulate, granula) – contain larger particles of regular shapes (spheres, platelets) or irregular shapes; fibrous composites – contain long or short fibers that may be oriented or unoriented, and may be of various origins (glass, carbon, polymeric, textile, etc.).

There are three basic groups of matrix material: metallic; macromolecule and inorganic (polymeric, bitumen); mineral (based on inorganic binders, ceramic, glass, carbon). Metallic matrixes have good electrical and thermal conductivity, are malleable, have good wear and heat resistance, and also provide the possibility of coating and bonding. The most widely used metallic matrixes are aluminium, magnesium, titanium and their alloys. For very high temperatures nickel-based alloys are used.

Polymeric matrixes are the most common type in production. In comparison with metals they have low weight, high strength, are corrosion resistant, do not require surface treatment, absorb vibrations and have low thermal and electrical conductivity. The mechanical properties vary according to the type of polymer, whether it is a thermoplast, thermoset or elastomer. For the production of composites all three types of polymers are used.

Ceramics is inorganic non-metallic heterogeneous material consisting of crystalline substances of varying composition and configuration. Ceramic materials generally have good chemical resistance, low thermal conductivity, high melting point, high hardness and compression

strength and are electrically non-conductive. The main disadvantage is the considerable brittleness, poor workability, and high sensitivity to internal defects. They are suitable for use at high temperatures.

According to the matrix material composites are classified into: Metal Matrix Composites (reinforced metals, cermet, alloys) – MMC; Polymer Matrix Composites based on macromolecular substances (reinforced polymers) – PMC; Ceramic Matrix Composites (ceramic and other inorganic composites: ceramics, glass, carbon) – CMC. Generally speaking almost every material used today is a composite. Materials in a pure form are almost unknown. Composites are indispensable in a variety of applications today: rocketry and aviation, the automotive and chemical industries, electrical constructions and many other areas.

Ex. 3. Answer the questions.

1. What is a composite material composed of? 2. How are composites created? 3. What is a continuous phase of a composite? 4. What properties do composite materials combine? 5. What does the strength of the composite depend on? 6. What materials serve as reinforcement in composites? 7. What do fibrous composites contain in their structure? 8. What are the main characteristics of polymeric matrixes? 9. How are composites classified according to the matrix material? 10. What industries are composite materials widely used in?

Ex. 4. Identify an odd word.

1. Strong, clever, ductile, tough, malleable. 2. Carbon, glass, textile, petroleum, polymer, ceramic. 3. Particle, granule, platelet, bar, fibre. 4. Aviation, rocketry, automotive, pharmaceutical, electrical constructions.

Ex. 5. Match the words with their definitions.

1) composite	a) inorganic non-metallic solid material made up of metal or non-metal compounds
2) matrix	b) action or process of strengthening
3) malleable	c) material made from two or more constituent materials
4) polymer	d) strong enough to withstand adverse conditions; not easily broken
5) ceramics	e) mass of fine-grained rock in which crystals, fibres, metals are embedded
6) rocketry	f) metal or other material able to be hammered or pressed into shape without breaking or cracking
7) reinforcement	
8) tough	
9) fibre	
10) carbon	

g) thread or filament from which a vegetable tissue, mineral substance or textile is formed
h) large molecule or macromolecule composed of many repeated subunits
i) chemical element that exists in its pure form as diamond or graphite
j) branch of science that deals with rockets and rocket propulsion

Ex. 6. Say whether the following statements are true or false.

1. Composites are created by synthetic assembly of two or more materials. 2. The properties of composites are worse than the properties of their components. 3. The continuous phase of a composite is reinforcement. 4. The strength of the composite depends on the environment. 5. The lower the reinforcement content, the greater is the strength. 6. Composites are often formulated with fillers and additives. 7. Dispersive composites contain very fine particles. 8. Polymeric matrixes have high weight and low strength. 9. Ceramic composites are suitable for use at low temperatures. 10. For the production of polymeric composites three types of polymers are used.

Ex. 7. Complete the sentences with the words from the table below.

thermal, strength, metals, matrix, disadvantage, properties, reinforcement, metallic, corrosion, particles

1. Composite material is composed of a … and reinforcement. 2. Composites combine the … of the reinforcement with the toughness of the matrix. 3. A hybrid composite combines the … of more than one reinforcing material. 4. According to the structure and geometry of … there are three types of composites. 5. Particulate composites contain larger … of regular and irregular shapes. 6. Metallic matrixes have good electrical and … conductivity. 7. The most widely used … matrixes are aluminium, magnesium, titanium and their alloys. 8. Polymeric matrixes are … resistant.

Ex. 8. Complete the sentences with the words derivationally related to the words in brackets.

1. The properties of a … are superior to the properties of their components (compose). 2. Matrix is a … phase of a composite (continue). 3. Reinforcing materials are characterized by … and low density (strong). 4. The higher the … , the greater is the strength (reinforce). 5. Composites are often formulated with … and additives (fill).

6. Fibrous composites may be of … origins (vary). 7. Metallic matrixes provide … of coating and bonding (possible). 8. Polymeric matrixes have low thermal and … conductivity (electricity). 9. Ceramic materials have good … resistance (chemistry). 10. They are suitable for use at … temperature (height).

Ex. 9. Put the words in the right order.

1. combines / the / composite / reinforcing / materials / of / several / hybrid / properties. 2. can / or / reinforcing / ceramic / the / polymer / metal / material / be. 3. composites / dispersive / and / composites / are / fibrous / there / composites / particulate. 4. basic / are matrix / there / material / of / three. 5. matrixes / good / metallic / resistance / have / wear. 6. type / mechanical / polymer / the / vary / the / according / of / properties / to. 7. materials / conductivity / ceramic / thermal / low / have. 8. composite / almost / used / material / today / every / is / a.

Ex. 10. Say it in English.

Матрица, армировать, композиционный материал, свойство, ковкий, зависеть от, углерод, волокно, наполнитель, теплостойкость, высокая прочность, состав, хрупкость, применение, связующее вещество (вяжущий материал).

Ex. 11. Complete the sentences using the information from the text.

1. Composites obtain specific characteristics and … . 2. Composites have better properties than their … . 3. The strength of the composite depends on the type of fibre … . 4. In some cases glass fibres are combined with other … . 5. The composite is often formulated with fillers and … . 6. Additives and fillers change composite performance … . 7. Fibrous composites contain fibres of various … .

GRAMMAR TEST ON MODULE 3

Note! Before performing the following exercises, it is recommended to repeat the verbals (Infinitive, Gerund, and Participle), namely: forms, functions, and constructions.

1. Use the Infinitive in the proper from (with or without *to*). Name the Infinitive function.

A. 1. Remind me (to phone) Ann tomorrow. 2. Do you want me (to come) early? 3. They made me (to do) it. 4. I saw her (to dance). 5. She

didn't expect us (to come). 6. I can't believe it (to be) true. 7. The children heard the bell (to ring). 8. We think the task (to be) difficult. 9. Nick noticed somebody (to come). 10. They know her (to be) a good singer.

B. 1. I've decided (start) a new project. 2. She is trying (learn) Italian. 3. Can you (lend) me your dictionary, please? 4. Mother forgot (book) the tickets. You shouldn't (argue) with your father. 5. Henry promised (help) her. 6. This old photograph made me (cry). 7. I really hope (get) an interesting job soon. 8. You must (pay) for the service. 9. Let me (introduce) myself. 10. I'd rather (let) the children (decide) for themselves.

C. 1. You ought (make) more of an effort at school. 2. You are not allowed (walk) on the grass here. 3. There's no need (rush) – just take your time. 4. It's difficult (read) English books in the original. 5. The soup is too hot (eat). You'd better (cool) it a bit. 6. It's nearly 8. You are going (miss) your lesson. 7. I must (return) the book to the library as soon as I have read it. 8. You'd better (stop) quarrelling now. 9. They made me (do) it. 10. Don't let him (drive) so fast.

2. Write the sentences using the Complex Object.

1. The Smiths want (we, visit) them next month. 2. Do you want (she, post) the letter for you? 3. Let (Mary, explain) you everything. 4. When do you expect (they, arrive)? 5. The man wouldn't like (his son, become) a dentist. 6. Alice didn't expect (the exams, start) in April. 7. Don't make (I, repeat that again). 8. The teacher let (the class, go) home early. 9. She wanted (her husband, borrow) some money to buy a car. 10. My brother taught (I, swim) and dive.

3. Use the Complex Object with or without *to*.

1. The mother made her son … tell the truth. 2. Let me … pay for the meal. 3. Lisa doesn't want Pete … come back. 4. Martha didn't expect David … ask such an embarrassing question. 5. They would like us … take part in the competition. 6. Glasses make him … look older. 7. My lawyer advised me not … tell anything to the police. 8. Having a car enables you … travel round more easily. 9. Don't let him … punish the child. 10. I've never been to England but I'd like … go there.

4. Complete the sentences using Infinitive Constructions. Remember that the verb before the Infinitive Construction must be in Past Simple. Use the model below.

On our first day in London, our guide (tell us / what / do) in London. → *On our first day in London, our guide told us what to do in London.*

1. She (show us / where / catch) the nearest bus or underground. 2. We also (learn / how / buy) tickets for the London underground. 3. On our second day, we (not know / whether / go) on a sight-seeing tour. 4. We (ask our guide / where / get) tickets for the sight-seeing tours. 5. She (plain / where / find) the tour guides and (how much / pay) for a sight-seeing tour. 6. On the sight-seeing tour we (find out / how / hop off and on the busses to see as much of London as possible. 7. We soon (know / which bus / wait for) at the stop. 8. We only (wonder / what / visit) first.

5. Express these ideas using the Infinitive constructions: Complex Object and Complex Subject.

1. Success is the child of audacity. (Benjamin Disraeli) 2. The will to win, the desire to succeed, the urge to reach your full potential… these are the keys that will unlock the door to personal excellence. (Confucius) 3. Fall seven times and stand up eight. (Japanese Proverb) 4. Success is one percent inspiration, 99 percent perspiration. (Thomas Edison) 5. Build your own dreams, or someone else will hire you to build theirs. (Farrah Gray) 6. Success consists of going from failure to failure without loss of enthusiasm. (Winston Churchill) 7. You miss 100 % of the shots you don't take. (Wayne Gretzky) 8. There are no shortcuts to any place worth going. (Helen Keller)

6. Replace the group of words in italics by an Infinitive or an Infinitive Construction according to the model below.

It is important *that he should understand* this. → *It is important for him to understand this.*

1. The captain was the last man *who left* the ship. 2. He got to the top *and was very disappointed when he found* that someone else had reached it first. 3. *The committee has decided to send you to* Paris. 4. Would you be *very* kind *and* lend me your umbrella? 5. There are a lot of sheets *that need mending.* 6. I was astonished *when I heard* that he had left the country. 7. It is better *that he should hear* it from you. 8. *I was rude* to him, *which was stupid.* (It was stupid …) 9. If he had another child *with whom he could play,* he would be happier. 10. It is necessary *that everyone should know* the truth.

7. Name the Gerund function in the sentences below.

1. Waiting for the Professor was a lame excuse for doing nothing. 2. The only remedy for such a headache as mine is going to bed. 3. We intend going to Switzerland, and climbing Mount Blanc. 4. In the night it started raining. 5. She continued walking. 6. Perhaps, you wouldn't mind Richard's coming in. 7. He was born with the gift of winning hearts. 8. After leaving her umbrella in the hall, she entered the living room. 9. In spite of being busy, he did all he could to help her. 10. One side of the gallery was used for dancing.

8. Translate into Russian.

1. They are likely to win the match. 2. She is unlikely to be a good actress. 3. We are sure to meet you at the station. 4. My parents are certain to believe me. 5. Los Angeles is sure to be the capital of the world movie production. 6. Celebrities are certain to need peace and quiet. 7. They are thought to have gone away some days ago. 8. The patient is unlikely to follow the doctor's recommendations. 9. This picture is sure to be the best at the exhibition. 10. The delegation is reported to be leaving Russia tonight at 11 a.m.

9. Determine the part of speech to which the words with the suffix *-ing* belong. Translate the sentences.

1. The monument needs restoring. 2. The monument of what century are you restoring? 3. The monument of what century is being restored? 4. The experts restoring the monument were provided with all modern technique. 5. The committee studied the problem of improving the bus service in the town without increasing the number of busses operating on the routes. 6. He pointed out that the assembling time of the apparatus was very short. 7. Heating the substance at high temperatures may change its properties. 8. With the help of a magnet we can hold two huge metal plates together without tying them. 9. Waiting for him I looked through the magazines lying on the table. 10. He heard the voices coming through the open window.

10. Choose the correct form of the Gerund. Translate the sentences.

1. (Reading, being read) English technical magazines is important for an engineer. 2. I remember (having been attended, attending) his lectures on history. 3. We were informed of new results (obtaining, being obtained) at the laboratory. 4. He remembers (adding, having added) some water to the mixture. 5. They began (having been made,

making) the experiment in May. 6. At the meeting they discussed different way of (improving, being improved) their work. 7. (Having heated, being heated) to high temperature the substance considerably expanded. 8. We heard of the experiment (being started, having been started) last week. 9. We know of Newton's (having developed, having been developed) the principles of mechanics. 10. On (coming, being come) to the laboratory he began a new experiment.

11. Translate the following sentences with the Gerund and Gerundial Construction.

1. He improved his report by changing the end. 2. They objected to his remaining at home. 3. Instead of restoring the old theatre they decided to build a new one. 4. What is the reason of his having left our city so suddenly? 5. What apparatus do we use for measuring air temperature? 6. The best way to solve this problem is experimenting. 7. The students like experimenting. 8. Experimenting is widely used in different branches of industry. 9. The engineer insisted on experimenting to solve this problem. 10. I remember of his having been interested in languages in his childhood.

12. Demonstrate your knowledge of Participle and its functions. Change the sentences below by the model and translate them.

As he was climbing down the tree one of the eggs broke. → *Climbing down the tree he broke one of the eggs*.

1. When leaving a car in this car park the brakes must be left off. 2. Wading across the river, the current swept me off my feet. 3. When filling a tank with petrol naked lights should be extinguished. 4. Running into the room, a rug caught her foot and she fell. 5. Reading the letter a second time the meaning becomes clearer. 6. When carrying a gun it should never be pointed at anyone.

13. Choose Participle 1 or Participle 2 form to complete the sentence.

1. I was so (pleasing / pleased) to meet him in the cinema. 2. Working late every day is very (tiring / tired). 3. All these strange facts are making me (confusing / confused). 4. My weekend was quite (boring / bored) because it was raining all the time. 5. Stop it! Can't you see she is (scaring / scared). 6. Lily was (shocking / shocked) by the news report. 7. I guess, she is (satisfying / satisfied) with her position. 8. I think, this instruction is rather (confusing /

confused). 9. This music is so (relaxing / relaxed). It calms me better than a cup of a chamomile tea. 10. The doctor was extremely (exhausting / exhausted).

14. Complete the sentences using the correct form of the word in brackets. Translate them into Russian.

1. "War and Peace" (write) by Leo Tolstoy is my favorite book ever. 2. Julie works in a bakery, (make) delicious pies, biscuits and cakes. 3. Unfortunately, most of the fans were (disappoint) with the concert. 4. The situation was really (embarrass). 5. Ginny was so (embarrass) because of her father's behavior. 6. What an (excite) occasion! 7. She will be so (excite) to go there – it is her dream, as far as I know. 8. This fine rose wine, (produce) in France, is famous all over the world. 9. Pictures (paint) by Van Gogh cost millions of pounds now. 10. A man (wear) a high-top hat came into the room.

15. Make one sentence out of two, making a Participle Clause (reduced relative clause).

We read an e-mail. It was sent by the director. → *We read the e-mail sent by the director.*

1. The man is in the garden. The man is wearing a blue T-shirt. 2. We found a doctor. He works at a hospital in London. 3. I often buy cheese. This cheese is imported from Paris. 4. I do not know much about the games. I mean the games that are played by children today. 5. Judy, the man is over there. He wants coffee and a piece of cake. 6. The pizza is in the kitchen. It was brought by Tom. 7. Her bag was stolen. The bag that was bought only a week ago. 8. Those pictures are mine. They are lying on the desk. 9. I really like flowers. The flowers that are grown only in my native town.

16. Translate the following sentences into Russian.

1. He entered the room without noticing her. 2. I remember your having objected to this proposal. 3. His greatest pleasure was travelling. 4. Being obtained in the laboratory the new substance had some valuable properties. 5. A site for the construction having been chosen, the work started. 6. The new materials recommended for bridge construction were described in the article written by our professor. 7. When reconstructed the theatre looked more beautiful than before. 8. To drive a car in a big city is very difficult. 9. We thought him to have taken part in the experiment. 10. The lecture was said to be very interesting.

MODULE OF FINAL CONTROL

4.1. ADDITIONAL TEXTS ON CHEMISTRY

Text 1. Organic Chemistry

Organic chemistry is the chemistry of carbon compounds. Organic compounds are compounds of carbon that usually contain hydrogen and that may also contain other elements such as oxygen, nitrogen, sulfur, phosphorus, or halogen (F, Cl, Br, or I). All organic compounds contain carbon; however, there are some compounds of carbon that are not classified as organic. For example, salts such as carbonates (Na_2CO_3, $CaCO_3$) and cyanides (NaCN, KCN) are usually designated as inorganic. In any case, there are very few carbon compounds that are not organic, while there are millions that are.

The field of organic chemistry includes more than twenty million compounds for which properties have been determined and recorded in the literature. Some new organic compounds are simply isolated from plants or animals; some are made by modifying naturally occurring chemicals; but most new organic compounds are actually synthesized in the laboratory from other (usually smaller) organic molecules.

Singular Attributes of Carbon. When one considers the millions of known chemical compounds and notes that more than 95 % of them are compounds of carbon, one realizes that carbon is unique. Why are there so many carbon compounds? It turns out that atoms of carbon are quite remarkable in a number of ways.

Carbon is the only element that can form so many different compounds because each carbon atom can form four chemical bonds to other atoms, and because the carbon atom is just the right, small size to fit in comfortably as parts of very large molecules.

Having the atomic number 6, every carbon atom has a total of six electrons. Two are in a completed inner orbit, while the other four are valence electrons – outer electrons that are available for forming bonds with other atoms.

Four valence electrons of the carbon atom can be shared by other atoms that have electrons to share, thus forming covalent (shared-electron) bonds. They can even be shared by other carbon atoms, which in turn can share electrons with other carbon atoms and so on, forming

long strings of carbon atoms, bonded to each other like links in a chain. Silicon (Si), another element in group 14 of the periodic table, also has four valence electrons and can make large molecules called silicones, but its atoms are too large to fit together into as great a variety of molecules as carbon atoms can.

Text 2. Inorganic Chemistry

The scope and boundaries of inorganic chemistry were shaped by the earlier field of organic chemistry in the mid-eighteenth and later centuries. Back in these earlier days of chemistry, all chemicals not classified as organic, in other words all chemicals, including minerals and alloys, that do not have an origin in living organisms, were placed in a very large category of "inorganic" substances. Many of the first chemists, therefore, used the describable differences between living and nonliving things to help delineate the boundaries of these two areas. Two common distinctions were that, first, organic compounds contained a unique "vital force" that arose from their biological origin and second, as a result, organic compounds could not also be synthesized or reproduced in the laboratory. Of course, both of these distinctions were later disproved, but they clearly helped form the divisions by which chemists have labeled themselves. Today a factor commonly used to distinguish between inorganic and organic substances is the presence of the element carbon. Inorganic chemistry, a vast field of study, is usually defined as the study of any compound that does not contain the element carbon, especially as it occurs in chemically bonded chains and rings that have additional chemical bonds to hydrogen atoms.

It should be noted that as chemists move increasingly toward interdisciplinary work, even this arbitrary distinction cannot adequately describe certain chemical compounds. For example, the solid material Sc_3C_4 (three parts scandium, four parts carbon) has ethane- and propane like organic fragments (without their hydrogen atoms) that are embedded in a solid matrix of inorganic scandium ions. In another broadly diverse field called organometallic chemistry, chains of organic-like carbon atoms form chemical bonds with inorganic metal ions such as zirconium, molybdenum, and nickel. Thus chemistry is becoming increasingly integrated and continuous, with no sharp boundary lines, as chemists realize that closely related ideas, such as

chemical bonding and acid/base classifications, can be broadly applied to both complex organic substances as well as to inorganic compounds.

Text 3. Chemical Reactions

A chemical reaction is a process in which one set of chemical substances (reactants) is converted into another (products). It involves making and breaking chemical bonds and the rearrangement of atoms. Chemical reactions are represented by balanced chemical equations, with chemical formulas symbolizing reactants and products.

For specific chemical reactants, two questions may be posed about a possible chemical reaction. Will a reaction occur? And what are the possible products if a reaction occurs? We will focus only on the second question. The most reliable answer is obtained by conducting an experiment – mixing the reactants and then isolating and identifying the products. We can also use periodicity, since elements within the same group in the Periodic Table undergo similar reactions. Finally, we can use rules to help predict the products of reactions, based on the classification of inorganic chemical reactions into four general categories: combination, decomposition, single-displacement, and double-displacement reactions.

Reactions may also be classified according to whether the oxidation number of one or more elements changes. Those reactions in which a change in oxidation number occurs are called oxidation-reduction reactions. The oxidized element increases its oxidation number while the reduced one decreases its oxidation number.

In *combination reactions*, two substances react to produce a single compound. One type of combination reaction involves two elements. Most metals react with most nonmetals to form ionic compounds. The products can be predicted from the expected charges of cations of the metal and anions of the nonmetal. For example, the product of the reaction between aluminum and bromine can be predicted from the following charges: 3+ for aluminum ion and 1− for bromide ion. Since there is a change in the oxidation numbers of the elements, this type of reaction is an *oxidation-reduction reaction*.

When a compound undergoes a *decomposition reaction*, usually when heated, it breaks down into its component elements or simpler compounds. The products of a decomposition reaction are determined

largely by the identity of the anion in the compound. The ammonium ion also has characteristic decomposition reactions. A few binary compounds decompose to their constituent elements upon heating. This is an oxidation–reduction reaction since the elements undergo a change in oxidation number.

Precipitation reactions are those in which the reactants exchange ions to form an insoluble salt – one which does not dissolve in water. Reaction occurs when two ions combine to form an insoluble solid or precipitate. We predict whether such a compound can be formed by consulting solubility rules. If a possible product is insoluble, a precipitation reaction should occur.

Text 4. Aluminum

Aluminum is found in Row 2, Group 13 of the periodic table. The first element in this group is boron**.** Aluminum is the third most abundant element in the Earth's crust, falling behind oxygen and silicon. It is the most abundant metal. It is somewhat surprising, then, that aluminum was not discovered until relatively late in human history. Aluminum occurs naturally only in compounds, never as a pure metal. Removing aluminum from its compounds is quite difficult. An inexpensive method for producing pure aluminum was not developed until 1886.

Today, aluminum is the most widely used metal in the world after iron**.** It is used in the manufacture of automobiles, packaging materials, electrical equipment, machinery, and building construction. Aluminum is also ideal for beer and soft drink cans and foil because it can be melted and reused, or recycled.

Aluminum was named for one of its most important compounds, alum, a compound of potassium, aluminum, sulfur and oxygen. It combines easily with many non-metals, including nitrogen, sulfur, phosphorus, and the halogens. Acid rain results when sulfur and nitrogen compounds – products of fossil fuel combustion – rise into the atmosphere and combine with water. Because iron has an affinity electronegative atoms such as oxygen, nitrogen and sulfur, these atoms are found at the heart of the iron-binding centers of macromolecules.

Aluminum has many useful properties. It is the commonest metal in the rocks of the Earth's crust. About 8 % of the crust is aluminium, not the metal itself but combined with other elements as natural minerals, such as bauxite.

The main properties of aluminium are as follows: 1) it is an excellent conductor of heat and electricity; 2) aluminium does not rust, it resists corrosion; 3) it has low density compared with other common metals; 4) it is good reflector of heat and light, it has a good metallic lustre (surface shine); 5) it is nonmagnetic; 6) it can be alloyed to form stronger or harder alloys than pure aluminium; and 7) it is easily workable (rolled into sheets, foil, and wire; cast or forged into useful shapes).

Physical properties. Aluminum is a silver-like metal with a slightly bluish tint. It has a melting point of 660°C and a boiling point of 2,327–2,450°C. The density is 2.708 grams per cubic centimeter. Aluminum is both ductile and malleable. Ductile means capable of being pulled into thin wires. Malleable means capable of being hammered into thin sheets. Aluminum is an excellent conductor of electricity. Silver and copper are better conductors than aluminum but are much more expensive.

Chemical properties. Aluminum has one interesting and very useful property. In moist air, it combines slowly with oxygen to form aluminum oxide. The aluminum oxide forms a very thin, whitish coating on the aluminum metal. The coating prevents the metal from reacting further with oxygen and protects the metal from further corrosion (rusting). It is easy to see the aluminum oxide on aluminum outdoor furniture and unpainted house siding. Aluminum also reacts quickly with hot water. In powdered form, it catches fire quickly when exposed to a flame

Text 5. Corrosion

Corrosion is the deterioration a material undergoes as a result of its interaction with its surroundings. Although this definition is applicable to any type of material, it is usually reserved for metallic alloys. Of the 105 known chemical elements, approximately eighty are metals, and about half of these can be alloyed with other metals, giving rise to more than 40,000 different alloys. Each of the alloys will have different physical, chemical, and mechanical properties, but all of them can corrode to some extent, and in different ways.

Corrosion is a natural phenomenon. When newly made steel is first exposed to the air, its originally shiny surface will be covered with rust in a few hours. The tendency of metals to corrode is related

to the low stability of the metallic state. Metals occur either in the pure metallic state, the zero oxidation state, or in the form of compounds with other elements (they acquire positive states of oxidation). In the natural world, most metals are found as compounds with other elements, indicating the greater stability of their oxidized forms. For this reason, to obtain the pure metal from one of its compounds, it is necessary to put in energy. The reverse is true when a metal is exposed to its environment: it tends to release this stored energy through the processes of corrosion. This is rather analogous to what happens when an object is suspended at a point above the ground (equivalent to the metallic state). When allowed to fall or reach a stable state, it returns to a position of minimum energy on the ground (equivalent to the metal's oxidized state).

Corrosion processes not only influence the chemical properties of a metal but also generate changes in its physical properties and its mechanical behavior. This is why the effects of corrosion are manifested in a variety of forms. The most common form is *uniform corrosion*, whereby there is a generalized, overall attack of the entire exposed surface of the metal, leading to a more or less uniform reduction in the thickness of the affected metal. In contrast, there is the process of *localized corrosion*, in which an intense attack takes place only in and around particular zones of the metal, leaving the rest of the metal unaffected; an example is pitting corrosion. Some other forms of corrosion are stress corrosion cracking, galvanic corrosion, selective alloy breakdown, intergranular corrosion, fatigue, friction, erosion, cavitation, hydrogen enbrittlement, biocorrosion, and high temperature oxidation.

Corrosion processes affect many areas of human activity in which metal products are used. In general, as levels of economic development increase, so do costs incurred as a result of corrosion. Many methods for preventing or reducing corrosion exist, most of them orientated in one way or another toward slowing rates of corrosion. Cathodic protection is an anticorrosion technique widely used in ships and in buried or submerged pipe work. This method seeks to reduce the rate of corrosion of the structure to be protected by joining it to "sacrificial" anodes. In other words, the structure is joined to another metal (an anode) that corrodes more readily, effectively diverting the tendency to corrode away from the structure.

4.2. FINAL GRAMMAR TEST

Complete the sentences below choosing the correct answer.

1. … English?	a) You are, b) Are you, c) Are he
2. No, I …	a) amn't, b) isn't , c) am not
3. … the students.	a) This is, b) That are, c) These are
4. I haven't got … cigarettes.	a) some, b) any, c) little
5. I … television now.	a) is watch, b) am watching, c) are watching
6. … you want a drink?	a) Does, b) Do, c) Are
7. They … to this university everyday.	a) comes, b) come, c) are coming
8. Jane is the … in the group.	a) most tall, b) tallest, c) taller
9. You … see him tonight.	a) will, b) are, c) want
10. I … do my homework.	a) can to, b) must, c) need
11. The windows … by the boy.	a) is broken, b) were broken, c) did break
12. … he has finished his work he can go home.	a) Then, b) Until, c) As soon as
13. He … us that he had been to Paris.	a) said, b) told, c) saying
14. The station is too far away … to.	a) to goes on foot, b) to walk, c) for walking
15. The garage …	a) is being rebuilt, b) was building, c) is rebuild
16. I'd like … English.	a) perfecting my, b) to improve my, c) to can speak
17. Didn't you … play tennis?	a) used to, b) use to, c) have used to
18. My sister enjoyed … the dinner.	a) cooking, b) to cook, c) is cooking
19. I was walking along the road when the car …	a) was crashing, b) crashed, c) had crashed
20. Tomorrow you … leaving England.	a) will be, b) can, c) are going to

21. By five o'clock he … Manchester.	f) has arrived, b) is arriving, c) will have reached
22. These machines …	a) need regulating, b) need to regulate, c) need to be regulating
23. Don't forget … me a newspaper, John.	a) buying, b) that you buy, c) to buy
24. Whenever there was a visitor, the dog … to the door.	a) will run, b) would run, c) was running
25. He is an engineer in …	a) the woodworking industry, b) woodworking industry, c) woodworking industries
26. Although my brother … in the team, we still lost.	a) is playing, b) played, c) had played
27. He advised me … the doctor.	a) to see, b) seeing, c) see
28. He didn't come last night. I wish that he …	a) had, b) did, c) was
29. My groupmate has been in hospital. I wonder how he …	a) is getting on, b) gets on, c) is getting away
30. … the leg, he couldn't move fast.	a) Having broken, b) Broken, c) Breaking

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