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# ENGLISH FOR BIOLOGISTS

*Утверждено редакционно-издательским советом*
*Орского гуманитарно-технологического института (филиала) ОГУ*
*в качестве методических рекомендаций*


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# СОДЕРЖАНИЕ

## ПОЯСНИТЕЛЬНАЯ ЗАПИСКА

Методические рекомендации являются частью учебно-методического комплекса по английскому языку для студентов I-II курсов естественнонаучного факультета, направление подготовки «Биология», аспирантов, слушателей курсов факультета повышения квалификации. Рекомендации составлены в соответствии с рабочей программой по обучению английскому языку на естественнонаучном факультете.

Материалы методических рекомендаций содержат тексты, тематика которых соответствует содержанию учебных планов 1-2 курсов по биологическим дисциплинам. Они посвящены отдельным вопросам из области общей биологии, ботаники и систематики растений, цитологии, микробиологии, биохимии, генетики, селекции, экологии, зоологии, физиологии растений, человека и животных.

В основу рекомендаций положена идея взаимосвязи и одновременного развития навыков чтения, перевода и устной речи. Тексты взаимосвязаны по содержанию, интересны по сюжету, доступны для понимания, перевода и пересказов, способствуют повышению мотивации студентов к изучению английского языка. Методические рекомендации построены с учетом принципов дифференциации и индивидуализации. Тексты содержат задания различного уровня сложности, а разнообразие текстов предоставляет возможность выбора и проявления индивидуальной заинтересованности.

Методические рекомендации состоят из 4 разделов. Каждый раздел состоит из текстов с разным целевым назначением. Раздел 1 (Unit 1) является основным разделом, содержащим тексты для детального прочтения, который способствует расширению словарного запаса и развитию навыков устной речи. После каждого текста даны упражнения и вопросы для обсуждения. В раздел 2 (Unit 2) включены тексты для перевода с английского языка на русский и с русского языка на английский. Данная работа предназначена для развития навыков перевода специальных текстов. Раздел 3 (Unit 3) предназначен для организации самостоятельной работы студентов и содержит тексты для домашнего прочтения. Раздел 4 (Unit 4) содержит тексты и задания повышенной сложности. Каждый текст предваряют вопросы, вводящие в проблемы и развивающие смысловую догадку и механизмы прогнозирования, упражнения на усвоение лексики способствуют ее лучшему усвоению, а коммуникативные задания развивают навыки устной речи.

# Unit 1
# BASIC COURSE

## Text 1. BIOLOGY

### Part 1

Biology is the science of life and people, who are engaged in it, are called biologists. They study the secrets of living things. Their discoveries are of great value to all mankind.

Biology tells us about our body: how it is constructed and how it functions. It gives us important information about other living things and how their lives affect mankind. Knowledge of biology will help you to keep healthy. It will be your guide in solving many of everyday living and scientific problems.

Biologists have made a great contribution to science. They have increased our food supply; they have developed new and better varieties of plants and animals. Scientific methods of farming have given us much more food. Biologists control many diseases. They have saved millions of lives by discovering the causes of these diseases and methods of prevention and cure. Vaccines, penicillin and sulfa are products of the biological laboratory.

Biologists have solved many mysteries of the body. They have discovered how blood circulates, how food is digested and many other secrets of life. They are now working in different fields of biology and their studies may lead to a solution of many problems.

A biologist's laboratory is a fascinating place. In it you may find a variety of plants and animals, some of which are invisible to the naked eye. There are powerful microscopes and other instruments. One of the most important tools of a scientist is his laboratory notebook. He always keeps very complete and accurate records of his observations and experiments.

In carrying out his work biologists use the scientific method that is:

1. They find out everything that is known about the problem by reading or by discussing the matter with others.

2. They think of several possible explanations or solutions. Some of these will prove to be wrong. One or more of the others may be right.

3. They test all the possibilities by experiments. They repeat the experiment several times. They make every effort to prevent errors.

When they have reached a conclusion, they inform other scientists who may repeat the work.

***Notes to the text***

to be of great value – иметь большую ценность
to keep healthy – быть здоровым
to make a contribution – сделать вклад
to be acquainted with – быть знакомым
according to – согласно, в соответствии
to do one's best – стараться

## EXERCISES

**I. Read the following words and guess their meaning:**

secret, to construct, function, information, problem, biology, contribution, method, control, million, vaccine, penicillin, sulfa, product, laboratory, result, circulation, experiment, accurate, discuss, inform, faculty, nature, botany, anatomy, microbiology, physiology, zoology, philosophy, genetics, museum, modern, mathematics, physics, specialization.

**II. State the parts of speech and underline the suffixes:**

science, information, to function, engagement, to circulate, biological, preventive, digestion, constructor, possibility, to repeat, knowledge, various, specialize, to inform.

## Part 2

Biology is the science of living things. The word «bio-logy» comes from two Greek words: bio – «life» and logos – «discourse» or «study». Biology includes all the facts and principles which have been derived from a scientific study of living things. The special study of plants, called Botany, and of animals, called Zoology, are the two great subdivisions of the science of biology. Plants and animals are called organisms, so biology may also be defined as the science of organisms.

Life exists in many places on the earth, often in spite of very difficult conditions. In the Arctic regions, the temperature may fall to 60 degrees below zero, while in deserts it may climb to over 120 degrees. Some animals live under the immense pressure of the deep seas, and others live near the tops of the highest mountains. But no matter where they exist, all living things must have certain necessary conditions. Let us see what these are: living things need oxygen, living things must have the right amount of pressure, living things must have water, living things need the proper temperature, and living things must have food.

Most people think that plants are not alive in the same sense that animals are, or that there is some fundamental difference between plant and animal life. But this is not so. Plants and animals have much in common. Their more important points of resemblance are:

1) The living substance of plants and animals is organized into protoplasm. Protoplasm is the basic material of all living systems and its general properties are fundamentally the same in each system both in plants and animals.

2) The living matter is organized in both plants and animals into microscopic units called cells.

3) Certain vital processes take place in plant bodies in the same manner as in animal bodies. These processes are respiration, digestion, assimilation, growth and reproduction.

4) Both animals and plants cannot live without water, air, food, light and moderate amount of heat. They both are of different shapes, sizes and colours.

In fact, the differences are not so many as the likenesses although they are more apparent, for only three are important, namely: plants are not conscious, they are unable to move about, and they make their own food.

*Notes to the text*

in the same sense – в том же смысле, что и ...
of the same kind – того же вида, сорта
to be certain – быть уверенным
no matter – неважно, безразлично
in spite of – несмотря на

## EXERCISES

**I. Read the following words and guess their meaning:**

special, zoology, organize, fundamental, microscope, accumulate, basic, oxygen, principle, respiration, fact, reproduction, process, temperature, region, manner.

**II. Form adverbs from the following adjectives and translate them:**

inclusive, scientific, definite, different, special, certain, common, fundamental, apparent.

**III. Give synonyms for the following words:**

to exist, immense, to form, to need, same, fundamental, some, common, vital, manner, to call, certain, main, likeness, right, basic, high, to resemble, general.

**IV. Answer the following questions:**

1) What is biology? Define it.
2) What do you call the science of living organisms?
3) What elements does living matter consist oft
4) Are plants and animals similar in their fundamental composition?
5) What are the differences and similarities?
6) How can biology be defined? What does the word «biology» mean?
7) Do plants and animals depend upon one another?
8) How do plants or animals differ from lifeless things?

**V. Compose short dialogues for the following imaginary situations:**

1. You are discussing hobbies and professional interests with your friends. Tell your new friends about your hobby groups, clubs and circles of your institute.

2. Your friend works or studies at the faculty of Chemistry. He urges you to transfer to this faculty. Reject his proposal and tell him that biology is your dream.

3. You have noticed that your friend has a special liking for research work. Persuade him to go to work at a research institute after graduation.

4. Next year you graduate. Tell your friend what you would like to do in the new year. Recollect how interesting it was to study at the University, Say you will do everything depending on you to make your work as interesting.

5. You are the Dean of the biological faculty. Tomorrow you are to speak to the first-year students. What would you tell them? What would you wish your future students?

6. Students of various faculties meet at a tourist camp. Everybody speaks about the importance of the science he studies. Prove that biology is the most vital of all the sciences.

**VI. Be prepared to speak on the topic «Differences and Similarities between plants and animals».**

## Text 2. ANIMALS AND PLANTS

No one knows how many different kinds of plants and animals there are. Some scientists estimate the number at three million. Many of them provide us with Food, clothing, shelter and medicines. Some, including several kinds of insects, pierce our skin and feed on the blood.

Others, both plants and animals, even live and grow inside our bodies. In this way they may cause disease. You can see why scientists study living things with great care. Our lives may depend on; how much we have learned about the living things around us.

Because there are so many, different kinds of plants and animals, the task of the biologists is not an easy one. Up to the present time it was named and described more than 840,000 kinds of animals and 345,000 kinds of plants. To keep track of this great number of living things a system of classification has been set up. Plants and animals are sorted into groups according to the way they are built.

For example, the tiger, the leopard, and the lion will be all grouped together. All of them belong to the cat family. All the members of the cat family, in turn, belong to a larger group that includes such meat-eating animals as the dog, the bear. They have teeth that are built for tearing and cutting flesh. Their sharp claws help them to capture and eat their prey. In this way, all plants and animals were classified by their structure. All living plants and animals were divided into two kingdoms: the animal kingdom and the plant kingdom.

Among the smallest and simplest living things there are some that are difficult to classify. There are tiny plant-like cells that can swim about actively in the water. In some cases, the classification of these is still in doubt.

The animal kingdom, as we have seen, includes many thousands of different animals. Scientists classify them further as follows:

Animal kingdom:

*A. Invertebrates (Animals without backbones)*

1. One-celled animals,
2. Sponges,
3. Cup animals (jelly-fishes and corals),
4. Spiny-skinned animals (starfishes and their relatives),
5. Worms,
6. Molusks (oysters, snails, squids),
7. Jointed-legged animals (lobsters, spiders, insects);

*B. Vertebrates (Animals with backbones)*

1. Fishes,
2. Amphibians (frogs.-toads, salamanders),
3. Reptiles (snakes, lizards and turtles),
4. Birds,
5. Mammals.

The plant kingdom includes tiny one-celled plants that can be seen only with a powerful microscope and the great redwood and sequoia trees of the Pacific coast, the oldest and the largest living things on earth.

Down through the ages, man has relied upon plants for many of his needs. The beauty of plants enriches our lives. Most important of all is the fact that the other living things in our world could not exist very long without their plant neighbours.

Some plants have no roots, stems or leaves. Some of them consist of only one cell. Others, like the giant seaweeds may be more-than 100 feet long. They are divided into two main groups. The algae have green chlorophyll. They can make their own food. The fungi have no chlorophyll. They must get their food from other plants and animals.

***Notes to the text***

in this way – таким образом
in turn – в свою очередь
up to the present moment – до настоящего времени
to take саге – заботиться
for example – например

## EXERCISES

**I. Read the following words and guess their meaning:**

number, medicine, classification, sort, tiger, group, leopard, structure, actively, moluska, effect, matter, detail, family, utilize, foundation, million, microorganism, type, cultural, contribution.

**II. Supply the nouns corresponding to the following verbs:**

to construct, to engage, to develop, to include, to estimate, to differ, to resemble, to provide, to know, to divide, to derive, to depend, to discover, to vary, to acquaint, to define, to value, to specialize, to describe, to classify, to act.

**III. Translate the following word-combinations into Russian and use them in the sentences of your own:**

to do one's best, to be certain, in spite of, to keep track, in common, no matter, in turn, according to, in this way, to take care, to be of great value, to keep healthy, to make a contribution, of the same sense.

**IV. Give another word or phrase of similar meaning to the following:**

substance, to be similar to, to study, to consider, to construct, discovery, important, resemble, minute, earth, century.

**V. Answer the questions:**

1. How many different kinds of animals and plants exist in the world?
2. Why is the classification of living things necessary?
3. How are living things sorted into groups?
4. What are the differences between animal and plant kingdoms?
5. How do men use plants and animals?

**VI. Compose short dialogues for the following imaginary situations:**

1. You are going to be a guide for a group of schoolchildren who have come to visit your faculty. Tell them about the biological museum and what they will see there.

2. Many people like to keep pets at home. Your friend is no exception. Ask him what animals he keeps. Tell him about plants and animals.

3. Your younger brother asked you what a coral is. Tell him what you know about it and other sea inhabitants.

4. Your friend says that not only animals cannot live without plants. What is your opinion?

5. You have been to a circus show. Please describe the tricks that the trained dolphins did.

**VII. Tell your fellow students what you have read about dolphins.**

Write a report on:

a) The friendship of dolphins and men;

b) Dolphins at the service of man

## Text 3. LINNEAN SYSTEM OF CLASSIFICATION

Carolus Linneus was born in Sweden in a small wooden house painted red with a roof of live turf. It was like many other houses in the village. But the house had a garden around it, so that Linneus used to say later that it was a good place for a naturalist to be born.

All the boy's teachers at school thought him stupid. But one of his father's friends observed that Carl took an unusual interest in plants and that he could identify a great many. He suggested sending Carl to study natural history. His father could give him only about forty dollars for his education, but it was thought that he could work his way. So he set off for the University of Lund. After a year he transferred to the University of Uppsala, since Uppsala had a very fine course of botany. His professor there soon grew very fond of him and saw a great promise in his work. After Linneus had finished his studies at the University with his professor's encouragement he made application to the Royal Society of Sweden to send him on a scientific expedition to Lapland, The Royal Society agreed to the commission. So on May 12, 1732 Linneus set out on foot on the road leading north. He travelled mostly on foot over bad roads and through wild country for nearly a thousand miles. When he got back to Uppsala he gave a careful account of the things he had seen. The main thing among them was his new system of classification for plants and animals which he had worked out on his journey. Three years later this system was published under the title «Systema Naturae». This system has brought order out of confusion. It was the system of nomenclature that has been used ever since.

According to Linneus system, every plant and every animal was given a double Latin name. The first word whose initial letter was capitalized would indicate to what «genus» or general class it belonged, the second word indicates a particular species. The naming of plants and animals in this way was a fascinating task. Linneus announced that everything in nature should be classified. So science as orderly classified knowledge was coming into its own. The first edition of «Systema Naturae» was published in 1735. It contained only twelve pages, but its influence was enormous. Linneus is therefore considered the founder of taxonomy – the study of the classification. All the known animal species were, grouped into six clases: mammals, birds, reptiles, fishes, insects and worms. The shortcomings were patched up easily enough later on. This form of binominal nomenclature has given the biolo-

gist an international language for life forms that has eliminated incalculable amounts of confusion. He even supplied the human species with an official name; one that it has retained ever since – homo sapiens.

### *Notes to the text*

to be like smb. – быть похожим на
to come into one's own – возникнуть, появиться на свет
to take interest in – интересоваться
to identify a great many plants – распознавать многие растения
to set off for the University – отправиться в университет
to set out on foot – оправиться пешком
to be fond of smb., smth. – любить кого-либо, что-либо
to see promise in his work – увидеть перспективу в работе
to agree to a commission – согласиться на командировку
to give account of smth. – дать отчет, рассказать о чем-либо
to work out – разрабатывать

## EXERCISES

**I. Read the following words and guess their meaning:**

interest, course, application, expedition, commission, mile, north, system, publish, form, capital, species, taxonomy, reptiles, nomenclature.

**II. Arrange the following in pairs of synonyms:**

vital processes, to estimate, main, country, enormous, to like, village, great, to think, to provide, living processes, to supply, principle, to account, help, to consider, to be fond of smb.

**III. Form nouns using the following suffixes and translate them into Russian:**

– er: to publish, to research, to speak;
– or: to invent, to investigate, to translate, to visit;
– ant (ent): to study, to assist;
– ist: natural, special, Marx, Lenin.

**IV. Give English equivalents for the following phrases:**

Он интересовался растениями и мог отличать их друг от друга. Он имел обыкновение вставать по утрам в 6 часов. Он мне очень нравится. Он подал заявление в аспирантуру. Я разработала план работы. Несмотря на плохую погоду, он пошел пешком. Он сделал все, что от него зависело. Согласно его квалификации, все живые организмы делятся на две группы.

**V. Put as many questions as possible to the text and be ready to answer them.**

**VI. Write a report on Linneus's life and work using additional literature.**

**VII. Give the main points of the texts and be ready, to speak on the topic «The History of the Science of Taxonomy».**

**VIII. Compose short dialogues for the following imaginary situations:**

1. You've come to a botanical museum and see a portrait of C. Linneus. Ask the guide about this scientist.

2. You saw a picture of a tiger with a sign «Panthera Tigris». Ask your friend to explain what it means.

3. You are to prepare a story on the system of classification, but you don't know what sources to use. Ask your friend for advice. What Russian book on Linneus can he recommend?

4. The teacher points to the tree and asks what it is. One student says that it is a common birch, the other – that it is Betula verrucosa. Each insists that he is right. How will you settle their argument?

## Text 4. THE MICROSCOPE

Even the ancients had known that curved mirrors and hollow glass spheres filled with water had a magnifying effect. In the opening decades of the XVII century men began to experiment with lenses in order to increase this magnification as far as possible. In this, they were inspired by the great success of that other lensed instrument, the telescope, first put to astronomical use by Galileo in 1609.

Gradually, enlarging instruments or microscopes from Greek words meaning «to view the small» came into use. For the first time, the science of biology was broadened and extended by device that carried the human sense of vision beyond the limit. It enables naturalists to describe small creatures with detail that would have been impossible without it, and it enabled anatomists to find structures that could not otherwise have been seen.

The first man, who made and used microscope was Anthony van Leeuwenhoek. He was not a professional scientist. In fact, he was a janitor in the city hall in Delft, Holland. He made more than 200 different microscopes, most of which had only one carefully polished lens. With his homemade lenses, he explored all sorts of things and discovered a world never before seen by the eyes of man. He examined milk, water, insects, the thin tail of a tadpole, and many other objects. His discoveries of bacteria, blood capillaries, blood cells, and sperm cells made him famous. In 1675, he wrote the first description of the microscopic animals that live in water. Leeuwenhoek's microscopes were simple. But his great patience and keen powers of observation brought to light many new facts about living things.

THE MODERN MICROSCOPE. The microscopes of today are far more complicated than those of Leeuwenhoek's time. They are called compound microscopes because they contain more than one lens. At the top there is an eyepiece which has two lenses in it. Then there is a long tube with more lenses at the bottom. These are called objectives. You can choose different magnifying powers by swinging different objectives into position. The usual high school microscope has a choice of two powers. With the low power, you can magnify an object about 100 times. The high power objective with the usual eyepiece can enlarge things up to 500 times.

If you wish to examine an object under the microscope you must pass a beam of light through it. As the light passes through the lenses, it is bent in such a way that

a magnified image appears. For this reason, anything you wish to see must be very thin. If it is too thick, the light will not go through it. Most microscopes have a mirror at the base. This can be moved in any direction. It reflects light up through the object and the lenses. The object, mounted on a piece of glass, is placed on a flat platform called the stage. Then the microscope is adjusted by moving the tube up or down. This places the objective at the correct height above the object. Unless you focus carefully in this way, you cannot get a clear picture.

THE ELECTRON MICROSCOPE. There is a limit to the magnifying power of the compound microscope. The very best of them can enlarge an object up to 4000 times. In recent years a new type of microscope has been invented that does not use light. Instead, beams of electrons are passed through the object and a picture is made on film. The electron microscope can give us an image 25,000 times larger than the object. This development illustrates an important principle of science: when a new instrument is invented, it may speed up discoveries in the laboratory. Already, the electron microscope has made it possible to see things never dreamed of by Leeuwenhoek. We may be sure that in the future-it will continue to reveal many new secrets of nature.

### *Notes to the text*

to graduate from – оканчивать учебное заведение
a graduate – выпускник
to a certain extent – в известной мере
to a great extent – в большой степени
to a full extent – в полной мере
in all appearance – по всей видимости

## EXERCISES

**I. Read the following words and guess their meaning:**

sphere, decade, lens, position, telescope, astronomy, fact, visual, professional, limit, object, bacteria, cappilary, sperm, instrument, reflector, platform, illustrate, film.

**II. State to what part of the speech the words belong and translate them into Russian; form the corresponding verbs:**

difference, assimilation, respiration, reproduction, organization, movement, magnification, resemblance, relation.

**III. Form the nouns corresponding to the following verbs:**

to discover, to construct, to affect, to know, to develop, to vary, to divide, to differ, to resemble, to observe, to suggest, to apply, to encourage, to agree, to magnify, to appear.

**IV. Underline the prefixes in the following words and translate them:**

to discover, invisible, unknown, to exclude, indifferent, unnatural, to mislead, impossible, independent, irregular, nonliving, disorder, illegal.

**V. Answer the questions:**

1) Explain how a microscope is used.
2) What is a compound microscope?

3) How does the electron microscope differ from the compound microscope?

4) Why are most compound microscopes more powerful than simple microscopes?

5) How will you examine an object under a compound microscope and an' electron microscope? What is the difference?

6) Why can't you see cells or protoplasm when you put your finger under the microscope?

7) What kinds of microscope do you know?

**VI. Compose short dialogues for the following imaginary situations:**

1. You know that Leeuwenhoek was not a professional scientist. Yet he corresponded with the Royal Society in London, where he sent his descriptions of what he had seen through his microscope. One day he was visited by one of the members of the Royal Academy. Try to imagine the conversation that might have taken place.

2. Two schoolboys discuss which microscope is better: the electron microscope or the light one. From their conversation it becomes clear they don't quite understand the difference between the two. Ask them questions in order to help them comprehend what the difference is.

3. You are a teacher of zoology. This is your first lesson on the use of microscope. Instruct the students in its use.

4. Your younger sister comes up to you and asks what a microscope is. Tell her what instrument it is, how it is constructed and what it is used for.

5. You are going to make a report «From Leeuwenhoek to the present». What will you include in it?

6. You are given a microscope without a mirror and asked to examine a leaf of an apple-tree. Will you be able to do it? Discuss it with your friend.

## Text 5. CHARLES DARWIN

Charles Darwin was born in Shrewsbury, England. In those days schools did not teach science as they do today. Twelve-year old Darwin, who wanted to spend his time out of doors collecting plants and watching animals, had to stay inside and learn how to write poetry. He was very bad, at it – so bad, in fact, that his father once wrote him angrily – «You care for nothing, but shooting dogs and rat-catching and you will be a disgrace to yourself and all our family».

Charles's father then decided that he should be a doctor and sent him to a medical school. But it soon became obvious that young Darwin was not at ail interested in medicine. So his father tried to make a clergyman out of him and sent him to the University of Cambridge. Still Darwin couldn't make himself care for anything but hunting and natural history. As soon as he graduated, one of Darwin's professors, a scientist, who understood him better than his father urged him to apply for the job of naturalist aboard of the H. M. S. Beagle. The ship was to make a voyage around the world, surveying trade routes and looking for ways to improve trade for British merchants in the far-off corners of the earth. The captain was willing to give up part of his own cabin to any young man who would go without pay as naturalist. Today no one remembers how much the Beagle helped British merchants. The information the trip yielded about trade was far less important than the knowledge that was to change

people's way of thinking. It was during his trip on the Beagle that Darwin first began to develop his theory of evolution. Everywhere he sailed he collected facts about rocks, plants and animals. The more facts he gathered from different parts of the world, the more he became convinced that things he observed in nature could not be explained by the old idea that each species had been separately created.

The more he wandered and observed, the more he began to realize there was only other possible answer to the puzzle. If all these species of plants and animals had developed from common ancestors, then it was easy to understand their similarities and differences. At some time, Darwin thought, the common ancestors of both the island and mainland species must have travelled from the mainland to the inlands. Later, all the species in both places, through slow changes, became different from each other.

After the Beagle returned to England, Darwin began his first notebook on the origin of species. During the next twenty years he filled notebook after notebook with still more facts that he and others discovered about the world of living things. These facts all led to one conclusion, that all living things are descended from common ancestors.

Darwin proved the truth of evolution, the descent with change of one species from another. Where others before him have failed, Darwin succeeded in convincing the world that he was right about evolution. He succeeded for two reasons. He collected an enormous number of facts and put them together so that they told the whole story. And he not only declared that evolution occurred but he also explained how it worked and what caused it. This he called the theory of natural selection.

Nearly a hundred years have passed since Darwin's great book, «The Origin of Species by Means of Natural Selection», was published. People have found out new facts about evolution, and especially about inheritance. These facts have made more precise our ideas of how natural selection works. This does not mean the theory was wrong. On the contrary, a true theory is alive; like everything else in the world it changes and grows. Only a dead, useless theory stays the same down to the last detail.

### *Notes to the text*

to fail – недоставать, не удаваться; ослабевать
his heart was failing – его сердце слабело
he failed, his exams – он провалился на экзаменах
he failed to appear – он не появился
he managed to come – ему удалось прийти
without fail – непременно, обязательно
I succeeded in + Gerund – мне удалось
care – забота, попечение
to take care of – заботиться
I don't care – мне все равно
he cared for nothing but – он ни о чем не думал, кроме
to look – смотреть, выглядеть
to look for – искать
to look after – присматривать за кем-то
to look at – смотреть на, обращать внимание
to look like – походить на

## EXERCISES

**I. Read the following words and guess their meaning:**

collection, history, doctor , naturalist, voyage, captain, cabin, theory, evolution, idea, reason, publication, detail, selection, poetry, interest, realize, especially.

**II. Give the derivatives of the following words:**

collect, assimilate, microscope, include, division, product, differ, direct, care, possible, publish, observer, evolution.

**III. Form the antonyms of the following words by using the prefixes – dis, mis, un, im, ex, non, de, il, ir:**

possible, regular, living, organic, legal, natural, like, compose, understand, necessary, pleasant, appear, able, dependent, conscious, approval, liberate, belief, calculate, countable, variability, valuable.

**IV. Answer the following questions:**

1. What do you know of Darwin's childhood?
2. What kind of sport was he fond of?
3. Why was he sent to Cambridge?
4. Who urged him to apply for a job of a naturalist?
5. What was the opinion of his father about his voyage?
6. What was the purpose of the «Beagle's» sail?
7. What puzzled Darwin during his sail?
8. What countries and islands did the «Beagle» visit?
9. When did Darwin begin to think about his theory of evolution?
10. What in Darwin's opinion led to a constant fight for life?
11. Did his book «The Origin of Species by Means of Natural Selection» cause a sensation and why?
12. What other books by Charles Darwin do you know? Have you read them?
13. Do you know where Charles Darwin is buried?
14. There were differences between animals and plants on the mainland and those on the island. What did Darwin think about it?
15. Say what you know about the biography of other biologists.
16. Speak about your hobby. What are you interested in?

**V. Read the text and be ready to answer questions about it.**

### *Darwin and evolution*

A hundred years ago people believed that plants and animals had always been as they are now. They thought that all the different sorts of living things, including men and women, had been put here by some mysterious power, a few thousand years ago.

It was Charles Darwin, born at Shrewsbury on February 12, 1809, who showed that this was just a legend. As a boy Darwin loved to walk about the countryside collecting insects, flowers and minerals. He enjoyed helping his elder brother at chemical experiments in a shed at the far end of their garden.

Because of this, his school friends called him «Gas». These hobbies interested him much more than Greek and Latin, which were his main lessons at school. His father, himself a doctor, sent Charles to Edinburgh University to study medicine. But

Charles disliked this work. He spent a lot of time with a zoologist friend, watching birds and other animals, and collecting insects in the surrounding countryside.

Then his father sent him to Cambridge to be trained as a clergyman. Darwin didn't want to be a doctor or a clergyman. He wanted to be a biologist.

**VI. Translate the text and be prepared to speak on the topic «The Origin of Men.»**

Since the days when men climbed down out of the trees, he has spread out all over the earth in hot countries and cold, in mountains, jungle swamps and fertile valleys.

Wherever men went they lived in ways that suited the climate and geography of the particular place where they settled. For a long time they continued to look pretty much alike. Then there developed differences – in their skin colour, in the shape of their heads and in other minor physical features. In Africa, the isolated group developed darker skins; in Asia, yellow skins and slanting eyes; in Europe – fair or «white» skins.

The feature most .used to distinguish the mankind is the colour of their skin. All three races – black, white, and yellow – are very much the same in other physical features. In each race there are some people who are tall and some who are short; some are long-headed, some round-headed. In each race there are some people who belong to blood group A, some to group B, some to AB and some to O. But all races are members of the same species. And wherever and whenever any group of any colour had the chance, they did their part in forwarding the march of human progress. History does not belong exclusively to any one race; it is shared by all. No race is more generous than any other race. You can make an important invention or write a great book or become a hero whatever the colour of your skin or the shape of your head may be.

## TEXT 6. THE CELL

The unit of protoplasmatic organization is the cell. The word «cell» is not a very good choice in this connection, but it has significance in the history of biology. The name was given by Robert Hooke, one of the first scientists having used a newly developed biological tool, the microscope, to the tiny divisions that he saw in thin slices of cork. The cork slice, through his microscope, appeared to be made up of many small compartments, arranged in rows, and reminded him of the tiers of monks' cells in English monasteries. He therefore called each compartment a cell and the name has survived, although it does not accurately convey the picture of a living unit. What Hooke actually saw in the nonliving wall which had once surrounded the living protoplasm, was not the protoplasm itself. His microscopic studies of some other materials, such as feathers, fish scales, molds, snow crystals and fabrics, brought him closer to the sight of living cells but not close enough to see the living substance.

Observations of the classical microscopists and those of their successors on individual cells as parts of organisms, both plant and animal, led to one of the greatest and for a time most useful of biological generalizations, the cell theory. This concept was first brought to general attention in 1838.

It was a natural outcome of the many observations that had been made during the early part of the nineteenth and the preceding centuries. Briefly, it states that all organisms are composed of cells or of a single cell and that all cells, and hence all organisms, arise from the division of pre-existing cells. This theory was to biology, at that stage of its development, what Dalton's atomic theory was to chemistry.

## EXERCISES

**I. Read the following words and guess their meaning:**

protoplasmatic, organization, substance, individual, general, division, chemistry, accurate, material, crystal, classical, concept, chemicals, membrane, region, population, mixture.

**II. Underline prefixes and suffixes having the negative meaning and translate the words:**

inconvenient, unfavourable, inorganic, invisible, countless, unpleasant; disintegration, helpless, deformation, useless, irregularity, insoluble.

**III. Find a word or a phrase with a meaning similar to the following words:**

investigation, period, to situate, small, piece, instrument, idea, result, short, importance, precisely.

**IV. Arrange the following in pairs of synonyms:**

exact, concept, brief, result, immense, to exist, fundamental, tiny, sort, disease, idea, shortly, conclusion, great, to live, basic, kind, illness, similarity, to make a voyage, likeness, precise, to travel, tool, instrument, small.

**V. Form verbs from the following nouns:** classification, organization, development, division, change, use, appearance, usefulness, observation, composer.

**VI. Draw up a plan of the text «The Celt» using sentences from the paragraphs or putting questions to each paragraph.**

**VII. Read the text and be ready to answer questions about it:**

What can you see when you examine different organs under the microscope? One thing will quickly stand but. No matter what part of the body you examine, you will find cells. They are the smallest living units of the body, just as bricks are the smallest units of a brick wall. Like other animal cells, each has cytoplasm, a nucleus and a thin cell membrane. The cells of the body are built in such a way that they can do their special work best. For example, muscle cells are long and elastic. Nerve cells are very sensitive. They have many branches which connect with other nerve cells or with muscles or glands.

Cells are so tiny that countless numbers of them go into the formation of our bodies. Our body consists of many different kinds of cells. These cells make up our tissues, which make up the organs. A tissue is nothing more than a group of similar cells all doing the same job. We have nerve, muscle, bone and blood tissues among others.

**VII. Translate the following passages and entitle them:**

1. Cells, as seen under the tight microscope or the electron microscope, are exceedingly complex structures. We find that these cellular arrangements have a functional significance and that specific cellular structures are associated with specific chemical components and specific biochemical properties.

Surrounding the nucleus of the cell is the cytoplasm. Embedded within the cytoplasmic sap may be distinguished such, structures as mitochondria, a network of partitions from which microsomes are derived, secretory granules, and other inclusions, each being with a complex internal structure of its own. The cell is surrounded by a cell membrane.

2. The cell membrane is the «surface of separation» between the cell and its surrounding fluid; it may or not be differentiated histologically. In the region of the sur-

face, or in the membrane itself, are complex enzyme systems, maintained from within the cell, actively transferring substances from the environment into the cell, actively extruding substances out of the cell.

The cell nucleus is the largest and densest of the structures isolated from ah animal cell. A surrounding membrane regulates the exchange of materials between the nucleus and the cytoplasm. Within the nucleus can be seen spherical nucleoli, and the chromatin threads which carry genes. The units of hereditary control are arranged along them. The characteristic compounds of nuclei are deoxyribonucleic acid. DNA carrying by virtue of their chemical structure, the genetically inherited information required for the maintenance of the whole cell.

**VIII. Write a report on «Cell Structure».**

**IX. Compose short dialogues for the following imaginary situations:**

1. Ask your friend if there is any difference between a green plant cell and an animal cell, and between a cell membrane and a cell wall. Discuss his answer.

2. A new student joined your group. He had studied at the Physical faculty. He doesn't know anything about the cell theory. Tell him all you know about it.

3. A space ship carried some substance to the Earth from another planet. Examining it under the microscope you saw a cell. What conclusion can you draw from this fact?

4. When the cells are placed under the microscope they will die, if they become dry. From your knowledge of protoplasm explain the reason for this.

5. Some old scholars were convinced that protoplasm has a nucleus structure, others said it is fibrillar, the third group tried to prove that it is cellular. All of them were mistaken. Why so?

## TEXT 7. THE STUFF OF LIFE

In their attempts to solve the mysteries of life, scientists have given much attention to the jellylike living material of the cell. This substance is called protoplasm. They have studied it under high-powered microscopes; broken it down into us basic chemicals; treated it with dyes and electric currents; and dissected it with microscopic needles. Yet no one has succeeded in making any protoplasm. It is one of the most complicated of all substances. We have learned many facts about it, but there are still many secrets to be discovered. Scientific research goes on, because protoplasm is the key to a real understanding of life.

Under the microscope, protoplasm is an almost colourless substance. At times it is quite liquid, but it can easily change to a more solid jelly. All the living parts of the cell, including-the cell membrane, the cytoplasm, and the nucleus are made of protoplasm. With a high-powered microscope we can see many small particles and bubbles floating in the jelly. These are often in rapid motion.

The chemical nature of protoplasm is not exactly known. Unfortunately, when chemists begin to analyse it, it usually dies. This brings about changes in the material they are studying. We do know that protoplasm is usually more than 75 per cent water. There are also salts and food materials such as sugars, fats, and proteins. Four chemical elements make up 98 per cent of protoplasm. These are carbon, oxygen, hydrogen, and nitrogen. More than 15 other elements have been found. All of these are the common elements of which our earth is composed. There are no Special elements that are found only

in protoplasm. But such rare elements as strontium (Sr), rubidium (Rb), tin (Sn), nickel (Ni), gold (Au) amd mercury (Hg) may enter into the composition of protoplasm as well. Where the soil is especially rich in certain minerals, the plants growing there may incorporate them, and they may find their way into the tissues or hard parts of animals that feed upon the plants. In some parts of the world gold is particularly abundant in the soil, and the hoofs, horns and hair of the deer living on the vegetation in these regions show relatively large accumulations of it: Radioactive elements in some regions are accumulated in the mosses and in vegetation of the region. These plants are the food for many animals and analysis shows that these animals are also accumulating radioactive particles in their tissues. The food chain is extended to people living in these regions who feed upon these animals and in turn incorporate the particles in their own tissues. As a result their bodies contain a relatively high account of radioactive particles as compared with the population in general.

As a summary it should be noted that protoplasm is a very complicated mixture of many kinds of substances. These are in constant activity, carrying on the processes of life. When the activity stops, life comes to an end.

### *Notes to the text*

to go on – продолжать
I am going to go on – Я собираюсь продолжать
at times – временами
to treat – подвергать действию, лечить
good fortune – удача
bad fortune – неудача

## EXERCISES

**I. Form adjectives from the following nouns by adding the suffix «al» and translate them into Russian:**

function, origin, condition, centre, structure, practice, logic, nature, evolution, addition.

**II. Find the derivatives of the following words in the text and state what parts of speech they are:**

abundance, mysterious, attentive, microscopic, treatment, success, complication, solidity, exclude, fortune, exchange, usually, comparative.

**III. Form adjectives from the following verbs by adding the suffix «able» and translate them into Russian:**

to desire, to move, to manage, to consider, to distinguish, to compare, to favour, to observe, to change, to question.

**IV. Form the plural of the following nouns:**

stimulus, nucleus, century, woman, goose, city, fish, toy, property, phenomenon, tooth, activity, genus, datum, nucleus, alga, bacterium, process, theory, box, medium, boundary.

**V. Form synonyms of the following words:**

research, substance, learn, to make up, to enter, certain, hard, enormous, to supply, rapid, occur, cause.

**VI. Read the text and reproduce it in Russian:**

The living substance of plants and animals is organized into protoplasm. Protoplasm is the basic material of all living systems and its general properties are fundamentally the same in each system, plant or animal. It does, however, differ somehow from one plant species to another, from one animal species to another. Protoplasm has a complex physicochemical structure. Common analytical procedures cause the death of protoplasm and thus bring about instantaneous changes in its structure. Nevertheless, a reasonably informative, picture of protoplasm is now available.

**VII. Compose short dialogues for the following imaginary situations:**

1. A student of your group is to examine protoplasm, but he doesn't know how to do it. Help him.

2. An acquaintance of yours has heard something about protoplasm and says that it resembles water. Describe the appearance of protoplasm and explain the difference.

3. Your friend declares that protoplasm is the most important substance in living things. Your point of view is that it is the nucleus that carries life functions. Try to prove it.

4. Your friend says that the words «protoplasm» and «cytoplasm» are synonyms. Explain the difference and prove that.

## Text 8. FOOD FACTORS

In the Dutch East Indies in 1897 men on the plantations were falling sick with a strange nerve disease. They were unable to eat or hold their food. Their arms and legs became paralysed and shrunken. So many were sick, that the hospitals had no more room for the victims of this disease, known as beriberi. The Dutch physician Dr. Christian Eijkman was sent from Holland to try to find out how to prevent and cure this disease. Eijkman was immersed in germ theory. He was sure that beriberi was a bacterial disease. He brought chickens with him and hoped to cultivate the germ in. them. But in this he failed. However during the course of 1896 these, chickens came down spontaneously with a disease very much like beriberi. Before Eijkman could do much about it, the disease vanished.

Searching for causes, he found out that a certain period of time the chicken had been fed on polished rice from the hospital stores and it was after that they sickened. Put back on commercial chicken food, they recovered.

Dr. Eijkman also learnt that the favourite food of the people was white-polished rice. This was prepared by rubbing off the brown outer coating of the rice grains. Dr. Eijkman decided to try an experiment. He fed a number of hens with polished rice until they became paralysed. The hens were then divided into two groups. One group, the control, was kept on the usual polished diet; the other group was given not only, polished rice, but the outer brown rice skins as well. In a short-time, the control group which ate nothing but white rice died of beriberi. The test group that received the brown rice polishing was cured.

This was the first carefully controlled experiment showing that there was something in a food that could prevent a dangerous disease. Eijkman did not appreciate the true meaning of this at first. He thought there was a toxin of some sort in rice grains

and that this was neutralized by something in the hulls. The hulls were removed when rice was polished, leaving the toxin in the polished rice unneutralized.

However, why assume the presence of two different unknown substances, a toxin and an antitoxin when it was only necessary to assume one: some food factor required in traces? The outstanding exponents of this latter view were Hopkins and a Polish-born biochemist Casimir Funk. Each suggested that not only beriberi, but also such disease as scurvy, rickets were caused by the absence of trace of food factors.

Under the impression that these food factors belonged to the class of compounds known as «amines» Funk suggested these factors be named vitamins (life amines) and ever since the name was adopted.

### *Notes to the text*

to fall ill – заболеть
to catch cold – простудиться
to have no room – не иметь места
before he could do much – до того, как он что-либо сделал
prevention of accidents – техника безопасности
mean – 1) середина; the golden mean – золотая середина
means – 2) средство, способ; by means of this – посредством этого, by all means – во что бы то ни стало, by no means – никоим образом
3) средства; private means – личные средства
4) значить, думать; It means that – Это значит что..., I mean – Я имею в виду, думаю
5) плохой; a mean man – подлый человек

## EXERCISES

**I. Read the following words and state what Russian words help to guess their meaning:**

effect, evolution, protein, original, formal, reason, companion, ordinary, stable, principal, subject, special, to combine, to accompany, reserves, person, balance, comments, foundation, detail, matter, modern, surprise, to utilize.

**II. State what part of speech the following words belong to and give their derivatives:**

naturally, originator, prevention, to cultivate, founder, researcher, favourable, preparation, division, usually, actually, arrangement, significance, solvent, solidification, relatives, accumulation, comparable.

**III. Remove the suffixes and prefixes in the following words and say what part of speech they belong to:**

growth, unlucky, accomplishment, density, usefulness, illegal, occurrence, to mislead, failure, explorer, investigator, various, differential, indefinite, basic, careless, relatively, considerable, meaningless, invariable, appreciation, decomposition, irresponsible.

**IV. Add negative prefixes to the following words:**

a) variable, convenient, direct, definite;

b) appreciated, favourable, natural, necessary, pleasant;

c) composition, formation, increase, compose, advantage, cover, approval.

**V. Arrange the following words in pairs of synonyms and antonyms:**

a) disease, to eat, to find out, to cure, spontaneously, to treat, to be cured, illness, to feed, to appraise, true, to search, grower, to discover, suddenly, to appreciate, to suppose, real, to fall ill, reason, to look for, to sicken, to catch cold, to recover, cause, plantator;

b) former, to fall ill, to be unable, careless, sick, to fall, presence, to be able; latter, antitoxin, to recover, healthy, to manage, spontaneously, absence, careful, continually, toxin.

**VI. Questions for discussion:**

1. What are nutrients? Give examples.
2. What is the chief use of sugar and starch in the body?
3. What are the good food sources of sugar and starch?
4. What is meant by a calorie?
5. What nutrient gives the most energy?
6. What is the chief use of protein in the body?
7. What are some good food sources of proteins?

**VII. Compose short dialogues for the following imaginary situations:**

1. We are preparing for the TV programme «Zdorovye». The question to be discussed is vitamins. Interview a physician on this point, please.

2. You are a doctor. You are consulting a patient with a strange nerve disease. Can't it be beriberi? Ask the patient about the symptoms and diagnose his disease.

3. You are Dr. Eijkman. You've made an experiment with two groups of chickens, one of which died. Share your impressions with your colleagues.

4. Arrange a competition entitled «What do we know about vitamins?» Divide the group in two. The team that utters the last sentence is the winner.

## Text 9. A WHITE-EYED FLY

To scientists, the most important mutation that ever took place happened inside a milk bottle – in an ordinary little fruit fly.

For a year, starting in 1909, Thomas Hunt Morgan, professor of zoology at Columbia University, had been breeding this little fly called Drosophila. Drosophila is a small, ordinary looking insect the sort you often find in grape arbors.

One day in 1910 professor Morgan noticed a very unusual sight in one of his fly-filled milk bottles. There, among all the red-eyed Drosophila was one with white eyes!

Was the white-eyed fly really something new, or would its offspring go back to the red eyes of the rest of the flies? Professor Morgan bred his white-eyed fly and waited to see what colour the eyes of the breed would be. Some were white! He had discovered a real mutation.

This single white-eyed fly started Professor Morgan and his co-workers off on eighteen years scientific work. They are known to have studied 15 million flies and found about 500 mutations. The mutations affected the development of every part of the flies' bodies, their legs, their shape and colour, their internal organs. Through the long years of work in the now famous «fly-room» at Columbia, Professor Morgan

and his colleagues were able to show that the genes were arranged on the chromosomes like beads on a string.

Drosophila seems almost made to order for scientists to study mutation. The flies are known to grow very easily on bananas or other simple food. They are hardly little creatures and will stand up under all kinds of treatment. They are known to have a great many clear, easy to recognize .features. They have, a very small number of chromosomes only 8 (man has 48 and the crayfish has 200). Most important of all, these flies breed very rapidly. It takes Drosophila only 12 days from the time an egg is laid to grow into mature fly ready to lay eggs in its turn. And under the right conditions, a single fly may lay over a thousand eggs.

Drosophila, trees, bacteria, molds, man and every other living thing – all have genes which pass along from parents to offspring generation after generation. What we learn about genes in one living thing tells us a lot about genes in all living things. In 1933, twenty-three years after the first white-eyed fly appeared in the milk bottle, professor Morgan was awarded the Nobel Prize in medicine for his part in showing how characteristics pass from one generation to another.

A few mutations are very striking and most mutations have little influence on development. Their results are so tiny that we never notice them. Occasionally, however, a mutation may have an important effect because it occurs under just the right set of circumstances.

Mutations occur rarely, but over the years they begin to pile up. Remember that in evolution we deal with many thousands even millions of years. After a million years, offsprings begin to have quite a few genes that are different from their ancestors.

But what causes mutations? Unfortunately scientists still know very little about what actually does make genes mutate. We do know that mutations can pile up in any direction. By X-rays or other treatments, scientists have made mutations take place much more often than they do naturally. So far, they have not been able to control the direction in which mutations take place. But even this may become possible before long. By treating such things as bread, mold and bacteria with certain chemicals scientists are known to make them mutate in direct way. The possibility of directing mutations in more complicated plants and animals will certainly increase as we learn more about the gene's chemistry and understand better what causes mutations in nature.

### *Notes to the text*

for his part – с его стороны
hard – твердый, упорно
hardly – едва
so far – пока
before long – скоро
under just the right set of circumstances – при удачном стечении обстоятельств
to stand up to all kinds of treatment – выдержать все виды обработки
to deal with – иметь дело

## EXERCISES

**I. Read the following words, and guess their meaning:**

mutation, characteristics, prize, directive, drosophila, banana, organ, colleagues, genes, control, number, result, effect, evolution, million, naturally, bacteria, structure, accompany, resources, to locate, ordinary, occupant.

**II. State to what part of speech the following words belong and translate then into Russian. Give alt the derivatives:**

scientist, happiness, important, mutation, unusual, discover, affection, internal, organ, fame, arrangement, treat, occasionally, nature, existence, origin, generation.

**III. Find synonyms for the following words in the text:**

to happen, a great many, right conditions, kind, occur, reason, the only, unusually, quickly, to see, to observe, circumstance.

**IV. Texts for discussion:**

### *What is intelligence?*

1. Although the question has n6t yet been settled many students of heredity believe that mental ability is an inherited trait. They base their claims on studies of certain families in which a high degree of intelligence appears repeatedly in the offspring. Other families have been studied that indicate that low intelligence may be inherited as well. It is true, that identical twins seem to have about the same level of mental ability. This is what we would expect if intelligence were controlled by genes, since identical twins have the same gene combinations.

Interesting studies have been made of identical twins who were separated after birth and raised in different homes. It was found that they sometimes showed greater differences in intelligence than would be expected if they had been raised in the same home. They also showed considerable differences in personality.

Scientists agree that you can do nothing to change your genes, but you can do a great deal to improve the traits controlled by your genes. Education and training will develop the mental traits that you have inherited. You can even improve your physical traits.

2. Actually there is no precise definition for this trait of intelligence. To most of us it means the capacity, for learning or simply the ability to learn. We know some things about intelligence. We know there is extreme variation in mental capacity among human beings. It ranges from idiocy at one extreme to genius at the other extreme, with most people having average or near average intelligence. From this we may conclude that multiple genes are involved. Also it seems from evidence accumulated that the extreme variations in intelligence among human beings are partly hereditary and partly environmental.

Education and training play an important part in bringing out intellectual potentialities. Yet even among persons with similar training there are great variations in general intelligence.

It has been observed that when children of the same family differ from each other in mental capacity, they usually continue to differ despite the fact that they live

in the same school. The important thing is for each one of us to apply ourselves and to get the most out of our inherited potentialies. Very few of us do it.

Can we conclude that heredity sets certain limits as to the results that can be obtained from study or training? Discuss the problem.

**V. Compose short dialogues on the following imaginary situations:**

1. The cover of the book «Genetics» is decorated with the picture of a Drosophila fly. Your friend from the physics faculty asks you if there is any connection between this fly and such a serious science. Can you give him your explanation?

2. As a tourist you come to the USA. Among other places of interest at Columbia University you are shown the «Fly Room». Ask your guide to tell you about the room.

3. You have read a book by Mendel, published at the beginning of the century. Compare the state of genetics at the turn of the century and at present.

4. You are in love and intend to propose. Your friend thinks the heredity factor of the bride's family should be taken into consideration. Should people who are planning to marry consider the heredity of their families? Discuss the question thoroughly.

## Text 10. IMPROVEMENT OF PLANTS

All varieties of crops have some desirable characteristics or they would not be used. Nevertheless, each of these varieties is known to possess one or more undesirable traits which, if eliminated, would result in higher yields and better quality. The aim of the plant breeder is to develop superior varieties by eliminating the undesirable characteristics and combining the desirable ones in the same variety.

Plant improvement is based on the principles or laws of heredity which are included in the science known as genetics. Many of the principles and techniques used in plant breeding are complex and to understand them fully intensive study and training are required.

Selection is a simple, but important method of improving plants. As the name suggests this method consists of selecting the outstanding types and discarding those that are undesirable because of certain characteristics being possessed by them. For example, in small grains, plants resistant to lodging may be selected; and with alfalfa those capable of surviving in severe winters are to be retained. After a period of testing, during which plants are selected for certain desired traits or characteristics, a superior strain may be developed, improvement by selection cannot be accomplished, however, unless the variety from which the selections are being made possesses some plants containing the characteristics desired. Selection is not a new method of improving plants. Actually this process is as old as plants themselves. For many thousands of years plants have been subjected to the stern and relentless forces of nature, and only the fittest is left entirely to nature, the process is extremely slow. Man cannot wait for nature alone to improve plants for him. By selecting superior plants, he is able to bring about improvements in a few years that would require thousands of years of time if left to nature alone.

Two procedures are commonly used when new varieties are developed by the process of selection. They are referred to as mass selection and individual selection.

Mass selection consists of selecting a fairly large number of individual plants possessing the desired characteristics. The seed from such plants is then mixed and sown together, and the better individuals are again selected or the poorer ones discarded. This process of selection is to be repeated for a few years until the plants prove to be reasonably uniform for the qualities desired.

Individual plant selection is commonly referred to as pedigree or pure-line selection. When this method is used, individual plants are selected that are superior for certain characters but instead of mixing the seed as in mass selection, the seed from each head or individual is planted in a row of its own in such a manner as to keep the progeny of each parent separate. The progeny of each plant are then carefully observed, a record being made of their appearance and performance. Comparisons between the different progenies are made, those with undesirable characters being discarded.

Records of performance are carefully checked and compared each year with those of standard varieties which are also grown under the same conditions. If after a testing for a number of years, the strain proves to be superior to the standard varieties, it is then grown in larger plots to increase the supply of seed.

A period of several years may be required for sufficient seed to be obtained for general distribution to farmers. As a rule, 8 to 14 years are usually required for making the selection, testing it and increasing it to the point where the new variety can be released to farmers.

### Notes to the text

as the name suggests – как указывает само название

whichever is most convenient – что является наиболее удобным

in a row of its own – на своем ряду

that are superior for certain characteristics – которые являются лучшими в отношении определенных качеств

he used to work – он имел обыкновение работать

## EXERCISES

**I. Read the following, words and guess their meaning:**

hybridization, intensive, characteristics, combine, complex, principles, technique, process, selection, standard, situation, extremely, individual, mixer, manner, period, general, superman.

**II. Give all the derivatives of the following words:**

to cover, to explore, to direct, to adapt, to situate, to act, to mix, to desire, to use, to vary, to select, to refer, to consist, to repeat, to plant, to separate.

**III. Find synonyms for the following words in the text:**

to wish, to have, different, to give, task, better, to combine, well-known, to fit, right, experiment, base, to use, together with, possibility, on condition.

**IV. Questions to be discussed:**

1. What are the agents producing change in plant life? Write a short report about it.

2. What other Soviet biologists working at the plant physiology do you know? What are their names and what problems do they work at?

**V. Compose short dialogues for the following imaginary situations:**

1. Your brother knows that Michurin has developed many kinds of fruits. He asks you how he managed to do it. Tell him about Michurin's work.

2. A foreigner came to our country to study Michurin's theory of mentor. Help him please.

3. You have planted a lemon-tree at home. It has grown 20 cm. high but there are no fruits on it. Ask your botany professor what you have done wrong.

4. A girl next door says both her friends and she like to work in the orchard, that they are «michurintsi». Ask her what she means.

5. You have come with a group of British and American biologists wishing to interview Michurin. Here he is in front of you. Ask him questions that are of interest to you. Don't forget to introduce yourself.

6. You are at a nursery choosing a fruit tree for your orchard. Ask a specialist for advice what plants would be most suitable, bearing in mind the climatic conditions. What particular varieties are most cold resistant?

7. You are standing near the famous «friendship tree» in the subtropical fruit experimental station in Sochi. Fifty varieties of lemons, oranges and other citrus fruits grow on it. Almost all of them were grafted on to the tree by friends from abroad during visits to Sochi at different times. Discuss with your friend what you would graft on to this tree on behalf of Kazan University students.

## Text 11. AIR POLLUTION

In recent years there has been great interest in the environment and many «new» words have become part of our vocabulary, words such as ecology, environment, photochemical smog and greenhouse effect. Simultaneously we have been made aware of environmental problems caused by the high technology created to achieve the material comforts we demand. Among these problems are the effects of air pollution. Air pollution causes increased respiratory illness in the old and young, decreases visibility, damages plants and animals and has possibly catastrophic effects on a global scale.

Air pollution has long been known to have an adverse effect on plants. If we first examine the physiology of the leaf, we can appreciate some of the reasons why damage occurs. The leaf veins function much as the blood vessels do in animals, acting as the transport system for water, minerals and food. The leaf tissue is in layers within a skin or epidermis layer on top and bottom and the photosynthesis cells in between. The stomata are entrances in the leaf bottom through which CO2 enters to take part in the photosynthesis process. These openings are protected by two guard cells which open and close to allow gases to enter or leave the leaf. Such gases can, of course, also include pollutants.

Most of our air pollution comes from combustion of fuels to produce heat and work. The very rapidly accelerating use of such fuels has greatly increased air pollution and the problem of air pollution has become the very urgent problem of our time. Initiatives to clear up one situation may in fact worsen it or create another, that's why the solution of this problem must have come from cooperative efforts between all nations and between all specialists, i.e. biologists, technologists and non-technologists.

## EXERCISES

**I. Read the following words and guess their meaning:**

ecology, effect, technology, comfort, respiratory, veins, visibility, catastrophe, canal, global, atmosphere, function, epidermis, meter, to produce, protection, reservoir, attack, irrigation, navigation, tourist, migration, collection, balance, population, to conserve, delicate.

**II. Find the root of the following words:**

growth, continuation, practical, effective, variable, appreciable, favourable, adversity, respiration, responsible, horrible, manifestation, adoption, recognizable, environment, acceleration.

**III. Arrange the following in pairs of synonyms:**

to convert, to preserve, aim, appreciation, leasure time, simultaneously, top, urgent, combustion, to act, high, important, burning, reason, contaminants, injury, pollutants, damage, free time, cause, adverse, opposite, reverse, to appreciate, at the same time, to estimate, to evaluate, to function, to turn into, to transform, to conserve, purpose, estimation.

**IV. Give the Russian equivalents for the following:**

to be aware of, to conceive the idea of, to take notice of, to put ideas into practice, the former – the latter, according to, due to, because of, to do one's best, in spite of, no matter, by means of.

**V. Texts for discussion:**

a) The chief reason why our wild creatures have disappeared is the destruction of their homes. When we cut down forests we force many birds and other animals to leave the area or die. The draining of marshes removes the nesting places of millions of ducks and other water birds. When cities dump their sewage into streams, rivers, they often make life impossible for the fish that once swam in the clear waters. If we wish to conserve our wildlife we must provide places where they can live as they did in the past. This is one of the chief aims of conservation-minded citizens.

The second cause of wildlife destruction is uncontrolled hunting and fishing by man. (Today, because of education and protective laws, hunting and fishing are not as serious and dangerous as they were in former years.)

Among the first efforts to stop the destruction of wild life were the laws passed to control hunting. Closed seasons were established during which the birds could not be hunted. A closed season usually lasts from March to September, when the birds are nesting and the young are being cared for. During the open season the hunters are permitted to shoot a limited number of birds.

1. When are the closed and open seasons in your district?
2. What is the limit for hunting and fishing in your place? Discuss the problem.

b) Nowadays shorter working days and weeks are common. This provides people with more leisure time. Whether you go camping or on a hike or travel by car or train, you will always find the world of wild life interesting. Trees, flowers, birds and insects will take on new meaning for you. You will recognize more of them by name. Perhaps you like pictures or collect things. Taking pictures is a fascinating hobby. Pictures of flowers, birds and many other animals are among the most inter-

esting you can get. Some people have the hobby of collecting insects, flowers, leaves. If you choose a hobby in the field of nature you will be assured a lifetime of healthy fun and recreation.

1. What are some hobbies based upon biological knowledge? (Fishing, collecting insects, raising pets, growing vegetables, photographing living things, making and keeping an aquarium, etc.)

Try to add other hobbies of this kind to the list and discuss the problem.

**VI. Compose short dialogues for the following imaginary situations:**

1. An international conference on Nature Protection is to be held next month. You are invited as a representative of our University. What will you say about air pollution? Ask your friends to help you to prepare a report.

2. Your young brother knows that man arid other animals take in oxygen by the lungs. He asks you to explain how plants breathe. Give your explanations;

3. A boy wants to burn a film to make a smoke screen. Come up to him and persuade him not to do it.

4. A group of tourists put up near a biostation. Instruct them on the conservation of the forest and its environment.

5. One of the enterprises was noticed to carelessly throw off the chemical wastes. As a result the lake in the neighbourhood is perishing. Explain to the administration of the enterprise their fault. How would you begin the conversation?

6. Your friend suggests going hunting during May Day holidays. Explain why it is impossible and persuade him not to do it.

7. You are a member of the State Committee for Control of Natural Environment. You are going to speak on the improvements of the environment in our country. What suggestions can you make?

## Text 12. I. P. PAVLOV

If you visit the Pavlov Biological Station at Pavlovo near Leningrad, you will see a very interesting monument there. It is a monument to the dog. The dog as you know played a very important part in all Pavlov's experiments on the activity of the higher nervous system. In the name of science and humanity, Pavlov wanted to thank the dog; so this monument was put up.

Then if you go to see Pavlov's study – the room in which the great scientist worked for so many years, you will notice another dog, a toy one, standing on the bookcase. This toy dog has a very interesting history. It comes from Cambridge, England, where there is one of the oldest Universities in the world.

On the 18th of July 1912, a group of students stopped before the window of a toyshop in Cambridge and looked at the toy dogs there. «There is the thing we want», said one of them, and he pointed to a big white dog in the shop window. They entered the shop and asked for this toy to be packed. Soon they came out with a parcel containing the big white dog. Then, laughing and talking, they hurried to the laboratory of their physiology professor and showed the dog to him.

The professor did not understand what it was all about until Archibald Hill, now one of the greatest physiologists in the world told him about their plan. It was this.

They knew that the next day some foreign scientists were to come to Cambridge. Among these was Ivan Petrovich Pavlov, the great Russian experimenter and physiologist. So the students wanted to present Pavlov with a toy dog. «Where did you get the idea from» – asked the professor. «I think it's an excellent one». «I got it from the grandson of Charles Darwin, who is now a student here», answered Hill. When Darwin got his doctor's degree at Cambridge, the students of that time gave him a toy monkey. That was how they showed that they supported his theory of the origin of man. Now we shall honour Pavlov in the same way.

The next day was a great holiday of Cambridge. Thousands of people came to see the foreign scientists receive their diplomas. The students watched the ceremony from the gallery. When the Speaker had made his speech, which was in Latin, the chancellor gave the doctors their diplomas one by one and they sat down at the great table on the platform.

Now it was Pavlov's turn. As he was moving slowly forward under the gallery, the students let the dog fall right down into his arms. He looked up, saw all the young, smiling faces above him and immediately understood what they meant. The students knew him too. It was one of the happiest moments in his life. As this was taking place, and old professor on the other side of the hall said to his neighbour: «Look, the students are giving Pavlov a toy dog. Did you see Darwin get his diploma? Do you remember him standing there with a toy monkey in his arms nearly forty years ago? History repeats itself, doesn't it?»

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Ivan Petrovich Pavlov set out to find out how the food made the stomach juice flow. Did it work through chemicals, or nerves, or what? Was this flow of juices influenced by what a person ate how the food looked and tasted, by the person's thoughts? Doctors, Pavlov realized, had to know the answers to these questions if they were going to make people healthier or even save their lives. Here is what Pavlov did: he anesthetized a dog – that is, he gave it some medicine that would keep it from feeling any pain. He made an opening in the outside wall of the dog's abdomen. Then he took a part of the dog's stomach and made a pouch of it. This pouch had all the nerves and blood vessels that the rest of the stomach had. Pavlov made-a separate opening in the pouch that led out through the hole in the abdominal wall.

Then Pavlov fed the dog. As soon as food got into its mouth, juice began to pour into the stomach. Some juice also poured into the pouch, and the scientist collected it in a little bottle through the opening in the abdominal wall. This experiment was one more proof that food itself starts its own digestion going. Pavlov showed that the presence of food in the mouth started nerve impulses that went to the brain and then to the cells of the stomach, then secreted or poured out juices. When he cut the vagus nerves, which bring impulses from the brain to the stomach, the dog's mouth could be stuffed with food yet no juices would be secreted in the stomach.

Just as you don't have to think in order to breathe, you don't have to think to digest. You can drink a glass of hot milk before you go to bed, and it will be digested long before morning. It is digested while you are asleep. We call such an activity of the body, which involves nerves and happens automatically, a reflex. When food enters the mouth, a nerve impulse goes to the medulla. This is then «reflected» back by the

nerves to the stomach. When the impulse reaches the stomach, the muscles contract and the cells secrete their juices. Physically and chemically, digestion has started. Pavlov also showed that the sight, the smell, even the thought of food could start the reflexes going and the stomach secreting. At the thought of a nice thick steak, you could really say: «My stomach waters». This kind of reflex Pavlov called a conditional reflex.

### *Notes to the text*

to go on excursion – ехать на экскурсию
to go in for sports – заниматься спортом
to get his way – добиться своего
higher nervous activity – высшая нервная система
to put up a monument – воздвигнуть памятник
to receive an honorary degree – получить почетную степень
to receive doctor's degree – получить докторскую степень
to present smb. with – дарить
present (adj) – I) присутствующий; 2) настоящий; 3) данный, тот самый; at present – в настоящее время; presently – вскоре, сейчас же; to be present – присутствовать

turn – поворот, оборот, перемена, очередь; in turn – по очереди; to turn (adj) – становиться, делаться; to turn pale – побледнеть; to turn old – постареть; to turn into – превратиться; to turn off – выключить (свет, газ); to turn on – включить; it turned out – оказалось

## EXERCISES

**I. Read the following words and guess their meaning:**

excursion, monument, gallery, humanity, physiology, impulse, diploma, ceremony, platform, anaesthetize, secret, negative, positive, compromise, diplomatic, intensive, expedition, medal, accumulate, genius, contract, cerebral, reflector.

**II. State to what parts of speech the following words belong and translate them:**

a) curious, inventive, dangerous, neighbour, powerful, rapidly, pollute, accelerate, creative, appearance, relative, decision, generalize, significant, conservation, useless, solidification, tiredness;

b) late – latter,
form – former,
hard – hardly,
true – truth,
to like – likely.

**III. Arrange the following words into pairs of antonyms and synonyms:**

a) early, to include, living, small, outside, to resemble, frequently, underlying, latter, to cover, question, large, late, to send, presence, contraction, to receive, youthful, expantion, to discover, difference, to exclude, to differ, overlying, insignificant, outer, resemblence, inner, inside, absence, former;

b) to make people healthier, to realize, to anesthetize, to set out, at once, to happen, to be full of, to enter, to cure, to understand, to collect, to notice, to get, to start, to keep from feeling pain, a hole, to get his living, immediately, to take place, to be stuffed with, to come in, to earn his living, to gather, to see.

**IV. Texts for discussion:**

### *A Conditional Reflex*

A hungry dog which is shown food will salivate. This is a reasonable reflex, for saliva is needed for the lubrication and digestion of food. If a bell is made to ring every time the dog is shown food, it will associate the sound of the bell with the sight of food. Eventually, it will salivate as soon as it hears the sound of the bell, even though it sees no food. This is a conditioned reflex, Pavlov was able, to show that all sorts of reflexes could be set up in this fashion.

In the case described above, if a part of the dog's brain called the cerebrum were removed, the dog would no longer perform the conditioned response. This proves that the cerebrum is the centre of conditioned reactions in the nervous system of dogs. Many animals, even earthworms, can be made to learn things by conditioning. Many acts in human beings are developed as a result of conditioning. For example, a spoiled child learned that he can get his way by crying. He has connected the act of crying with his ability to get what he wants. Conditioning is really a very simple form of learning. You are not born with any conditioned reactions. But you develop them throughout your whole life.

### *An Unconditional Reflex*

Harry was on his way to school in a great hurry. As he ran along, he kept thinking of what would happen if he arrived late for his First class. His teacher had spoken to him very seriously the last time he was late. She had explained the importance of developing the habit of being on time. Suddenly he tripped over a stone and his books went flying in all directions as he fell heavily, face forward. After a moment, he was able to pick himself up off the ground. Fortunately he was not badly hurt, but then he looked at his hands. They were dirty, scratched and bloody. He wondered how he had been able to throw up his hands quickly enough to save his face from serious injury. He had done it automatically without thinking. It was a case of a reflex act performed in time to protect his face against harm. This is an example of an unconditional reflex.

**Questions for discussion:**

1. Give your own example of conditional reflex. What is a conditional behaviour?
2. Name some important functions of your body that are controlled by reflexes.
3. Describe one of your own experiences in which you avoided serious injury by the action of your responses.
4. In what way does conditional behaviour differ from a reflex response?
5. How does a person develop a fear of something harmless? Give an example of your own experience of conditional behaviour.
6. How can an animal be trained to perform tricks? Is his behaviour conditional or unconditional? Why?

**V. Summarize the general ideas of all the texts of the lesson:**

a) Write a short report on the topic: «Pavlov is a great physiologist of the world».

b) Make a report on any problem concerning Pavlov's investigation.

c) Speak on the importance of Pavlov's work in the field of: Physiology, Psychiatry, Pedagogics.

**VI. Compose short dialogues for the following imaginary situations:**

1. You are a teacher of biology. The subject of your lesson is reflexes. Explain the difference between; conditioned and unconditioned reflexes.

2. Two groups of students met to discuss the types of experiment on digestive tract. You are among the supporters of the «chronic» type. Try to prove that you are right to the other group which defends the «acute» type.

3. You are a professor of physiology. Your students are to be shown an experiment with a dog. But your assistant doesn't know how to prepare a dog. Teach him how to do it.

## Unit 2
## TEXTS FOR READING AND TRANSLATING

**1. Read and translate the text, reproduce it.**

I am a student of the biological faculty. Our faculty is one of the largest faculties of the University. We study different subjects: Botany, Anatomy, Microbiology and many others. Besides these subjects we study Political Economy, Philosophy and English. We study English to be able to read scientific books on biology.

There are many departments in our faculty: of botany, of zoology, of microbiology, of physiology of man and animals, of physiology of plants, of genetics, of soil science, of conservation of nature, of bionics, etc. Besides there are research laboratories and museums. Every student has an opportunity to work in modern, well-equipped laboratories, where different problems of biology are under investigation.

Students are acquainted with all branches of biology. They are lectured in various subjects of natural science, namely botany, zoology, anatomy, microbiology, biophysics, biochemistry, soil science, bionics, genetics.

During the first two years they attend lectures on mathematics, physics, chemistry, political subjects and foreign languages. In the third year more narrow specialization begins. They have several specialized courses and additional practical and research work in the subject they have chosen as their future speciality. Besides attending lectures they may join some scientific circle and choose a problem to work on according to their bents. All of them know that biology is the science of glorious past and great future. They do their best to acquire as much knowledge as possible:

Graduates of the biological faculty are assigned to work at laboratories, schools, research institutes. Those who have a bent for research work may apply for a postgraduate course of study.

**2. Translate the text without a dictionary trying to guess the meaning of the unfamiliar words from the context.**

Biology gives us an acquaintance with the world of living things and an understanding of some of the great fundamental laws and processes of nature. There are many special fields of knowledge and many phases and principles to which elementary training in general biology is essential.

These include medicine, physiology, agriculture, horticulture, forestry, sanitation, hygiene and many others. Because man is an organism subject to the same laws which govern alt living things and is built according to the same plan as other higher animals, an elementary knowledge of biology gives us a basis for an understanding of our own body.

**3. Translate the following into English.**

Биология – наука о живых организмах. Она изучает тайны живой природы: как устроены живые организмы, как они функционируют. Результаты исследований биологов имеют большое значение для развития многих отраслей науки. Исследования биологов помогают решить многие проблемы современной науки. Они помогают понять взаимосвязь между всеми организмами и окружающей средой (environment). Определение сущности жизни (essence of life) – одна из основных задач общей биологии.

**4. Translate the text into Russian; say what new information about plants and animals you have got from it.**

Biology is the study of living things. In studying them we learn the relations of plants and animals to one another, with the world about them and how we can control them. Biology is commonly divided into two branches – botany and zoology. Both animal and plant life is continually changing and there are great differences and likenesses between them.

All organisms are capable of responding to changes in the environment by reacting to external stimuli.

In animals this coordination and response to stimuli are accomplished by sense organs and the endocrine and nervous systems.

Plants lack a nervous system, and specific sense organs, but they respond to external stimuli and their chemical coordination in somewhat analogous to that regulated by the endocrine system of animals.

Both plants and animals have hormones. Thus substances are produced in one part, of the organism and in very small amounts, influence specific physiological processes when transported to another part of the organism. Plant hormones, however, are not produced in specific glands as animal hormones are, and they differ chemically from the hormones of animals, being in general simpler substances. Other substances which act like hormones but are not known to be produced by the plant are called plant regulators. The study of plant hormones and these synthetic substances is one of active fields of plant physiological research and their use in agriculture has become very important.

**5. Head the text; guess the meaning of the unfamiliar words from the context.**

In external appearance, plants are usually green. Some plants have varied and colourful flowers and others have no apparent blossoms. Among animals there is great variety of sizes, shapes and colours. The basic difference between plants and animals lies in the unit of structure and function of each, namely, the cell. Plant cells have a cell wall which is actually nonliving in chemical nature. Animal cells do not have this.

**6. Translate into English.**

Живые организмы могут жить в различных условиях. Некоторые обитают при очень высоких температурных условиях, а другие легко переносят сильные морозы. Все они должны были приспособиться к окружающей среде.

Биология изучает жизненные процессы как животных, так и растений. Эти два больших подразделения в биологии называются ботаникой и зоологией. Как растения, так и животные должны иметь определенные условия для существования. Как животные, так и растения не могут жить без воздуха, воды, пищи и света. Одинаковые жизненные процессы имеют место, как у животных, так и у растений. Эти процессы называются дыханием, пищеварением, ростом и размножением. Очень важный принцип живых организмов – это способность реагировать на внешние раздражения. Животные реагируют на внешние раздражения через нервную систему и органы чувств. Растения также приспосабливаются к окружающей среде и реагируют на внешние воздействия. Однако механизм ответной реакции раздражения у растений сильно отличается от животных.

**7. Translate the text into Russian and then back into English, compare your version with the original.**

a) In this rich varied world there are large plants, like trees, some of which are the largest living things. There are plants, thousands of which can live in a small drop of water. There are helpful plants that man cultivates, and harmful ones. Plants that live in water, and those that live only on land; plants that produce flowers and fruit, and others that do not; plants that live for hundreds of years and plants that live for only a few hours.

b) Green plants are so common that you may never stop to think how wonderful and how important they are. A good way to begin our general study of plants is to compare them with animals.

c) WHAT LIFE FUNCTIONS ARE? As we study more about plants and animals and how they live, we shall see that all of them perform several functions in common. These are called life functions. One way of studying animals and plants is to begin with their life functions. These life functions are: sensation (irritability), motion, food-taking, nutrition (digestion, absorption, circulation, assimilation), respiration, excretion and reproduction.

**8. Translate into English.**

Ученые утверждают, что существует более миллиона различных видов растений и животных. Растения и животные сильно отличаются друг от друга

размерами, видом, цветом и т. д. Эти различия хорошо видны, если сравнивать растения, травы, деревья, цветы или различных насекомых, птиц, рыб, людей. Несмотря на все различия, живые организмы имеют много общего. Как растения, так и животные зависят друг от друга в поддержании жизненных функций.

**9. Read the following passages, without a dictionary and reproduce them in Russian to your classmates. Work in pairs.**

a) Visitors to Khosta, a resort on the Black Sea Coast, always go to see the great silver poplar that grows there. Ten people with joined hands can just encircle the tremendous tree, rising sixty five metres above the ground. The unique plant is at least 160 years old.

b) Deep in the sea it is always dark, for sunlight cannot reach down more than about a half mile. The only light in all this vast darkness is made by animals themselves. Certain squid which are cousins of octopuses, swim in schools and keep together by means of coded flashing lights. Many kinds of deep sea fish have lights on their bodies. It is believed that this, beaming of light helps them to recognize their own kind.

c) Scientists know that all living organisms are luminous. But why? Hundreds of guesses were made and thousands of experiments staged. Now Moscow scientists, supervised by Academician N. Semyonov, have established that luminosity of living organisms is their mode of jettisoning excessive energy, of «letting off steam», so to speak.

Is there any practical use to be had from the discovery? Yes. It was established that the luminosity of the organisms is connected with their general condition. Cells affected by cancer, for example, are less luminous than healthy ones. Thus one more method of discovering the presence of that illness has been found.

d) Plants are sensitive to sound. Indian botanists have proved that by subjecting plants to sound of definite pitch, it is possible to stimulate or hinder their growth. A seven-year experiment showed that rice and tobacco are the most «musical» plants.

**10. Read and translate the text with a dictionary.**

The present-day science of taxonomy or systematics has been recognized as a specialized branch of biology for over 200 years. During the century, a Swedish doctor and botanist Carl von Linneus travelled over most of Western Europe and England, collecting and studying the plants and animals of the region. He had a passion for classification and a genius for minute and accurate observation and for detaching the important from the trivial. His standards for describing and naming plants and animals and the criteria by which he estimated relationships and affinities were innovations for his time. His method of classification and the system he used for the comparatively limited number of organisms that were known to him are the foundations upon which the modern systematic groupings of biological systems have been built.

Linnean system of classification was founded oh the concept of a basic natural grouping of like individuals, called a species. He conceived of the species as a fixed and unchangeable grouping of similar individuals. He based his comparisons principally on morphological features and species was characterized, named, and filed away as an immutable entity. Such a system is essentially static and does not recognize the possibility of change. With the development of theories of evolution, the concept of species has changed. In the constant change and evolution, a species cannot be regarded as absolutely fixed.

**11. Translate the text into Russian and then back into English, compare your version with the original.**

Living things are all about us. More than a million different kinds of plants and animals inhabit the earth. Some are our friends, others are our enemies. Some are very large and some are very small. Yet each is a distinct organism, and each has its own way of living.

Suppose you were asked to learn the names of all the living things on the earth. Try to do it. No, you couldn't do it; no one could. Fortunately, there are groups of animals and groups of plants that greatly resemble each other. Because of this fact living things may be classified into large groups.

To study living things, it is necessary to sort them into groups. About a million and a half different kinds of plants and animals have already been studied, identified and named. In fact, for people who have not studied biology, the living world is a hopeless conglomeration of individual plants and animals.

**12. Translate the text into Russian and then back into English, compare your version with the original.**

In science one of the most important discoveries having a great influence on the development of science was the fact that microscope has come into common use among scientists. The microscope gave scientists new power. Now they could see things that had been hidden. The first microscopes were very simple. They had only single lenses, some had double lenses with a tube between them. Anton von Leeuwenhoek was the first man who penetrated through these lenses into the mysterious world of the microbe. No one before his time had guessed that such tiny organisms existed.

**13. Read the text and be ready to answer questions about it.**

By examining water from a lake or stream we will find that it is full of life. If you look carefully, you may find there the simplest animal, the ameba. It is a tiny mass of jelly usually about 1/50 of an inch long. The ameba is surrounded by a very thin cell membrane, which is quite elastic. At times, a part of the membrane will push out, forming a false foot. The rest of the ameba will then flow into it. In this way, the little animal moves slowly about in its watery world.

**14. Read and translate the following text.**

Anton von Leeuwenhoek lived all his life in Delft. He had hardly any education and never learnt Latin, which in those days was the mark of an educated man. He worked when a boy as a clerk in a dry-goods shop. Part of his duty there was to examine textiles with a fine hand lens. Sometimes he placed the lens over other substances besides cloth – the skin of his own hand, the fiber of the wood on the table. Later on in his spare time he used to go to the spectacle makers and he learnt from them how to polish tenses. Afterwards he began making lenses himself. The lenses he made were precise and beautiful. Altogether he made 247 instruments and some of them would increase the size of a minute object as much as 270 times. After he had learned something about metalwork he could mount them. When he was about forty he became so interested in everything seen through his lenses, that he spent much of his time looking through his microscopes.

One day he had focused his microscope on a drop of water from a rain barrel and had found in it to his great astonishment «little beasties» as he called them,

swimming about. He had found these little creatures not only in rain water, but in pond water, in the secretions of various animals, even in the saliva of his own mouth. Examining different objects he continued to find all manner of strange little organisms, although he did not realize, that they might have any connection with diseases. Only in the 19th century Louis Pasteur developed and demonstrated by his experiments the germ theory. But it was Anton von Leeuwenhoek's discovery of microbes that started a new field of scientific investigation.

**15. Reproduce in your own words.**

В России выдающиеся работы по усовершенствованию микроскопа были осуществлены М. В. Ломоносовым, Л. Эйлером и др. В XIX веке собственного производства микроскопа еще не было, лишь во время мировой войны в Петербурге были сделаны попытки создания своего оптического производства.

Развитие микроскопической промышленности в больших масштабах началось лишь после Октябрьской революции при участии выдающихся советских оптиков Д. С. Рождественского и С. И. Вавилова. Были созданы заводы как по изготовлению микроскопов различного типа, так и по изготовлению оптического стекла. В настоящее время биологические, поляризационные и электронные, микроскопы изготовляются в количестве, полностью покрывающем потребности огромного множества научных и практических лабораторий России.

**16. Read and translate the following text without a dictionary and guess the meaning of the unfamiliar words.**

Very little can be seen in living cells with the ordinary light microscope. The structure of the cells has been made visible by various procedures: killing the cells, fixing their components in a stable condition, and staining these components so that their structural details may be observed. Cell material was embedded in a substance, which can be cut in very thin sections for viewing. The development of the light microscope has been paralleled by the development of method for preparing cells for study. By 1920 all the major components of cell which can be demonstrated with the light microscope have been described.

**17. Read the text and be ready to answer questions about it.**

What can you see when you examine different organs under the microscope? One thing will quickly stand but. No matter what part of the body you examine, you will find cells. They are the smallest living units of the body, just as bricks are the smallest units of a brick wall. Like other animal cells, each has cytoplasm, a nucleus and a thin cell membrane. The cells of the body are built in such a way that they can do their special work best. For example, muscle cells are long and elastic. Nerve cells are very sensitive. They have many ranches which connect with other nerve cells or with muscles or glands.

Cells are so tiny that countless numbers of them go into the formation of our bodies. Our body consists of many different kinds of cells. These cells make up our tissues, which make up the organs. A tissue is nothing more than a group of similar cells all doing the same job. We have nerve, muscle, bone and blood tissues among others.

**18. Translate the following passages and entitle them.**

1. Cells, as seen under the tight microscope or the electron microscope, are exceedingly complex structures. We find that these cellular arrangements have a functional significance and that specific cellular structures are associated with specific chemical components and specific biochemical properties.

Surrounding the nucleus of the cell is the cytoplasm. Embedded within the cytoplasmic sap may be distinguished such, structures as mitochondria, a network of partitions from which microsomes are derived, secretory granules, and other inclusions, each being with a complex internal structure of its own. The cell is surrounded by a cell membrane.

2. The cell membrane is the «surface of separation» between the cell and its surrounding fluid; it may or not be differentiated histologically. In the region of the surface, or in the membrane itself, are complex enzyme systems, maintained from within the cell, actively transferring substances from the environment into the cell, actively extruding substances out of the cell. The cell nucleus is the largest and densest of the structures isolated from ah animal cell. A surrounding membrane regulates the exchange of materials between the nucleus and the cytoplasm. Within the nucleus can be seen spherical nucleoli, and the chromatin threads which carry genes. The units: of hereditary control are arranged along them. The characteristic compounds of nuclei is desoxyri-bonucieic acid. DNA carrying by virtue of their chemical structure, the genetically inherited information required for the maintenance of the whole cell.

**19. Translate the text and be prepared to speak on the topic «The Origin of Men.»**

Since the days when men climbed down out of the trees, he has spread out all over the earth in hot countries and cold, in mountains, jungle swamps and fertile valleys.

Wherever men went they lived in ways that suited the climate and geography of the particular place where they settled. For a long time they continued to look pretty much alike. Then there developed differences – in their skin colour, in the shape of their heads and in other minor physical features. In Africa, the isolated group developed darker skins; in Asia, yellow skins and slanting eyes; in Europe – fair or «white» skins.

The feature most .used to distinguish the mankind is the colour of their skin. All three races – black, white, and yellow – are very much the same in other physical features. In each race there are some people who are tall and some who are short; some are long-headed, some round-headed. In each race there are some people who belong to blood group A, some to group B, some to AB and some to O. But all races are members of the same species. And wherever and whenever any group of any colour had the chance, they did their part in forwarding the march of human progress. History does not belong exclusively to any one race; it is shared by all. No race is more generous than any other race. You can make an important invention or write a great book or become a hero whatever the colour of your skin or the shape of your head may be.

**20. Translate the following into English.**

Любимым занятием Дарвина было собирать растения и наблюдать за животными. Он ничего не любил делать, кроме коллекционирования разных рас-

тений. Дарвин должен был стать доктором, но совершенно не интересовался медициной. Однажды он услышал, что корабль должен был совершить поездку вокруг света. Именно на этом корабле Дарвин начал думать о теории эволюции. Чем больше видел разные виды растении и животных, тем больше убеждался, что он прав. Когда вернулся из путешествия, начал писать книгу о результатах своей поездки. Дарвин ничем не интересовался, кроме своей книги. Он продолжал собирать новые факты, и чем больше работал, тем яснее видел связь в происхождении разных видов животных. После длительной работы и наблюдений написал свою знаменитую книгу «Происхождение видов», а в 1859 году описал, как и почему один вид произошел от другого. Чарльз Дарвин умер в 1882 году.

**21. Translate the text into Russian and then back into English, compare your version with the original.**

Robert Hooke, an English scientist, who lived at the same time as Leeuwenhoek also made and used microscopes. One day, he cut a very thin s(ice of cork and put it under his lenses. He noticed that it was made of «a great many little boxes» separated by walls. He compared these to the cells of honey comb. All of the cells were filled with air. This explained why cork was light and why it floated so easily.

The piece of cork that Hook examined was not alive. At one time, each «cell» had contained living matter, but the living material had died. As scientists continued to examine living things under the microscope, they slowly came to realize, that both plants and animals were made up of cells. One can easily see living plant cells in a very thin strip of onion. These cells fit together much like the bricks in a house. They have a cell wall made of non-living woody matter.

**22. Translate the text into Russian in writing.**

***Cells, Tissues, Organs, and Systems***

With few exceptions, protoplasm is organized into microscopically visible units called cells. Cells are the smallest Irving units (except for the viruses). They are variously shaped, have a considerable range of size, and are associated in different ways. They all have structural features in common. In some instances single cells constitute entire organisms, each such cell carrying on all the life processes. Or small numbers of cells may be associated in colonies. In these colonial groups all cells appear similar and have the same function. In other aggregation of cells there is often division of labour, particular cells being more concerned with some life functions than with others. This division of labour becomes increasingly important in the higher forms of life which have great structural complexity. In these higher plants and animals the cells are organized into tissues, or groups of cells with similar structure and functions. Combinations of tissues make up organs with more or less distinct functions. In the animals, which are functionally more complicated than plants, the organs are associated in systems, or groups of organs that are collectively responsible for certain functions.

**23. Reproduce the text in your own words.**

Клетка – элементарная живая система, состоящая из двух основных частей – цитоплазмы и ядра. Она является основой строения, развития жизнедеятельности всех животных и растительных организмов. Клеточное строение обнаруживается на различных уровнях организации живой природы. Итак, клетки, составляющие тело бактерий и простейших, являются самостоятельными организмами; в отличие от этого, клетки, входящие в состав тканей многоклеточных организмов, представляют собой элементы, полностью подчиненные целостному организму. Основной план строения животных и растительных клеток сходен, однако последние отличаются некоторыми особыми чертами. У животных, например, нет микроскопически видимых оболочек, а все растительные клетки окружены хорошо выраженными целлюлозными оболочками, которые могут иметь сложное строение и включать различные органические и неорганические вещества. Клетка, как живая система, поддерживает и восстанавливает свою целостность, адаптируется к условиям среды и выполняет различные функции за счет энергии вещества, пополняемой из окружающей среды. Любая клетка, являясь сравнительно высокоорганизованной формой живой материи, имеет сложный химический состав. Именно внутренняя структура клетки обеспечивает взаимодействие одних ферментов и разобщенность других, благодаря чему биохимические реакции протекают согласованно и в определенной последовательности.

Описание особенностей, присущих большинству тканевых клеток и клеток простейших, составляет задачу общей цитологии. Частная цитология изучает отдельные морфологические типы клеток.

**24. Read and translate the text into Russian and then back into English, compare your version with the original.**

The phenomena of life are associated with a particular substance called protoplasm, which has definite and specific characteristics. Physically, protoplasm is a grayish jelly-like substance. Its consistency varies with different internal and external conditions from a fluid to a firm jelly. Protoplasm is found within the cells of living organisms. They are the smallest microscopic structural units of life. Chemically it is a complex mixture of many different combinations of elements. Analysis of the protoplasm of different kinds of organisms show that thirty-four elements may enter into its composition.

**25. Translate the text with a dictionary in writing.**

The nucleus is a fairly large, generally spherical body located more or less centrally in the cell. It stains in a distinctive manner and includes one or more dense, heavily staining bodies, the nucleoli.

The nucleus is the controlling center of the cell. An enucleated cell, or a cell fragment without a nucleus, can 'carry on some of its functions for a short period, but its ability to grow is limited and reproduction cannot occur. On the other hand, fragments containing-a nucleus may grow and may eventually divide. Correlation of observations on inheritance with details of cell structure shows clearly that, with a few

exceptions, the factors .that control heredity are located in the chromosomes, which lie in the nucleus and make up most of its bulk. The chief components of these hereditary factors, the genes, appears to be DNA. To a great extent DNA controls cell growth and cell function. RNA performs a function outside the nucleus related to the nuclear activity of the chromosomal DNA.

**26. Translate the text without a dictionary and guess the meaning of the unfamiliar words.**

***Cell components***

Extensive knowledge of the cell and its parts has been gained from the highly developed techniques of microscopy and cell chemistry. The cell is bounded by a cell membrane and may also be bounded by a cell wall. All living components within this cell membrane are often referred to as the protoplasm. The protoplasm includes a nucleus and a mass of substance surrounding it, the cytoplasm. The cytoplasm may contain small differentiated areas or small organs known as organelles and non-living material, such as excretory products or reserve food. The cell, these organelles, and the nucleus are membrane bound. The membranes are usually composed of associated layers of lipid and protein. They are important not only as boundaries of the cell and cell components but also as surfaces on which metabolic reactions take place.

**27. Translate the text into English.**

Изучение составных частей клеток и протоплазмы было начато после открытия микроскопа. Под микроскопом ученые увидели маленькие ячейки, которые были названы клетками. Позднее обнаружили протоплазму. Все основные жизненные функции организма заключены в протоплазме. Она состоит из ядра, окруженного веществом, названным цитоплазмой. Химический состав протоплазмы сложный, ученые долго не могли ее изучить. Когда ученые начинают исследовать ее, она меняет свою структуру и умирает. Но исследования продолжаются, и в настоящее время много уже известно о свойствах, структуре и составе протоплазмы.

**28. Translate the text without a dictionary. Guess the meaning of the unfamiliar words.**

The term «vitamin» has undergone important changes in meaning since it was first introduced; as a result it carries with it some imprints of all its different meanings. Forty years ago it was believed that the essential constituents of a diet were protein, carbohydrate and fat (these three foodstuffs together must be present in sufficient amounts to yield the full calorie requirements), certain minerals (inorganic ions) and water. But later when a chemically pure diet of this kind had been prepared and administered, the animals died; natural food therefore, contains other, non-calorie-providing, but nevertheless essential, constituents for growth, health and lives. In rats, addition of small amounts of milk to a diet which according to the theories then current was adequate, preserved health and restored growth; the unknown essential factors in milk were called «accessory food factors» by Hopkins. The accessory food factors or vitamins were soon divided into: 1) fat-soluble; 2) water-soluble. The

fat-soluble were differentiated into vitamins A and D. The water-soluble – into B and C. It was soon found that vitamin B was not a single substance, but a mixture of several substances. Us title was altered to vitamin B complex and the individual constituents as they were isolated, were given distinctive names, the chemical identity of the vitamins was worked out and many such substances are now known. They are: vitamins A, D, E K, C (all fat-soluble) and B complex (all water-soluble).

The distinctive characteristic of the vitamins is that they are micro-constituents of the diet of high biological activity which cannot be replaced by other normal dietary constituents.

**29. Read the following passages and present their summary in Russian to your class-mates. Work in pairs.**

**Vitamin C Requirements in Man.** Accumulated experience and the experiments recorded show that, in adult humans, 10 mg of dietary ascorbic acid is completely protective anti curative over long periods. To allow a margin of safety a daily intake of 30 mg is recommended. This is readily, achieved by a normal Western diet – one orange, or half a grapefruit, or a generous helping of lightly-cooked cabbage. The recommended 30 mg is of ingested vitamin, so that the aim of 70 mg. makes liberal allowance for maltreatment by the cook ruefully. The unit of heat energy in food is called a calorie.

**Fats.** They give much more energy than do starch or sugar. (You can easily burn fatty foods peanuts or walnuts by lighting them with a match.) Fats do not burn this way in your body cells, but they are used to produce heat and energy. Fats do more than simply supply calories. They are necessary for the continued health of the cells. Rats are unable to grow on a fat-free diet. Children in war-born Europe who had no fat in their diet did not grow properly either and were very weak and underdeveloped.

**Protein**. They supply energy but that is not their chief use in the body. Every time a new cell forms, protein is needed to make up its protoplasm. Life would be impossible without proteins since protoplasm is made of them. Because they are needed for the growth and repair of tissues, proteins are among the most important nutrients. In the body they are broken down into amino-acids. Twenty-two-different amino acids are known, and of these ten are absolutely necessary for life.

**Minerals.** There are several different minerals needed for health. All of them come from our food and water. They are calcium and phosphorus, fluorine, iron, iodine and many others.

**30. Translate the following in writing**.

***Syndromes of salt loss***

Men working hard in hot moist atmosphere sweat profusely. If they replace the water lost but not the salt, NaCl deficiency is produced. A common symptom is widespread intense and exceedingly painful cramps, of the muscles probably due to the harmful effect of the low Na content of the interstitial fluid. The cramps are relieved by drinking saline solution (0.5 per cent) or by taking salt tablets. Nowadays such workers are given salt tablets prophylactically.

**Vitamin B group.** This group consists of series of water-soluble organic substances, which are found in all cells of all species, from the bacteria, protozoa, and yeasts up to the highest mammalian forms. Most of the members of the group are constituents of fundamental tissue enzyme systems, involved in the oxidation of the foodstuffs, and are therefore indispensable for the normal functioning of all tissues. The best studied members of the group are thiamine, riboflavin, and nicotinic acid, generally found together in foodstuffs but not necessarily in the same, proportions. Most of the vitamin B group can tie synthesized by the intestinal bacteria.

**Vitamin K.** Vitamin K, one of the «youngest» vitamins, discovered only some 30 years ago, is of great importance for the proper coagulation of blood. It is essential for the formation of prothrombin, a proteic substance necessary for clotting a blood vessel to stop a hemorrhage.

In 1942, Academician Alexander Palladin, a prominent biochemist, and his staff synthesized vikasol, a new preparation, which contains an analogue of vitamin K. During World War II, vikasol won a good repute for itself among army doctors. Injected intramuscularly or intravenously, it quickly stops various hemorrhages.

Now researchers have found a new application for vikasol – it is used as a preparation against inflammations and as a means for increasing the resistance of organism to radioactive irradiation.

But vitamin K, as the scientists learned, is essential not only for blood clotting. It plays an active role in the so-called tissue breathing of the organism's ceils, in the metabolism. It is as necessary for each living cell as air is vital for man.

**Sugars and starches.** Sugars and starches are important sources of energy in your food. They are present in candies, cakes, potatoes, bread and many other common foods. Most of the starch and sugar you eat is changed to simple sugars like glucose in your digestive system. When they travel through the blood stream, some of the sugars are stored, but others will be burned in the cells to produce the energy we need for life. It is possible to measure the amount of energy produced by a food by burning it outside the body.

**31. Reproduce in your own words.**

Витамины – пищевые вещества, необходимые для поддержания жизненных функций. Организм человека и животных не синтезирует витамины, поэтому получать их должен в готовом виде. Недостаток витаминов в пище или изменение процессов их усвоения приводит к нарушениям обмена веществ.

Витамины должны поступать в организм постоянно в относительно определенных количествах. Однако содержание витаминов в пищевых продуктах подвержено значительным колебаниям и не всегда полностью обеспечивает потребность в них организма. Эти колебания связаны с сезонными изменениями состава пищевых продуктов, неравномерным употреблением ягод, фруктов, овощей. В СССР на предприятиях пищевой промышленности проводят витаминизацию продуктов массового потребления, особенно продуктов детского питания.

Открытие витаминов тесно связано с изучением роли отдельных пищевых веществ. Во второй половине XIX в. считалось, что для нормального функционирования организма достаточно определенного содержания в пище белков,

жиров, углеводов и минеральных солей и воды. Однако в течение долгого времени ученым не удавалось, установить причину происхождения многих заболеваний. В 1880 г. русский исследователь Н. И. Лунин установил, что в пищевых продуктах имеются еще неизвестные факторы питания, необходимые для жизни. Выводы Лунина были в дальнейшем подтверждены С. А. Сосиным, а в 1897 г. – врачом Эйкманом. В 1906-1912 годах по предложению Гопкинса и польского ученого Функа эти вещества были названы, витаминами.

**32. Read and translate the text without a dictionary and reproduce it.**

An important part in moulding Timiryazev's scientific views was played by eminent Russian natural scientists – D. I. Mendeleyev and A. N. Beketov. D. I. Mendeleyev – the chemist and author of the periodical system of chemical elements, began his pedagogical work as assistant professor at the Petersburg University at the time Timiryazev entered it. Mendeieyev was already known as the author of important scientific investigations and had tremendous prestige among the students.

It is very significant that Timiryazev, writing almost half a century later about his first expulsion from the University, said that he found it especially hard to be deprived of Mendeleyev's lectures and did laboratory work under him. The many hours spent by Timiryazev in the great chemist's laboratory were not in vain. He became a splendid and persistent experimentor.

Having finished the University, Timiryazev was eager to start practical work without delay. He gladly accepted Mendeleyev's offer of work on one of the four experimental plots organized at Mendeleyev's suggestion for studying new methods of agriculture and use of mineral fertilizers. Timiryazev's work there was of the utmost importance for his later scientific and practical activities. While studying problems of the mineral alimentation of plants, Timiryazev began his research in aerial alimentation, to which he later devoted particular attention.

**33. Translate the text into English.**

Имя знаменитого русского ученого К. А. Тимирязева хорошо известно в нашей стране. Он родился в 1843 году. В 1861 поступил в Петербургский университет, но вскоре был исключен за то, что принимал активное участие в студенческих собраниях. Только через год он смог продолжить образование экстерном и окончил университет с золотой медалью.

В 1877 году Тимирязев стал профессором Московского университета, но не получал никакой поддержки в своей работе со стороны администрации, несмотря на то, что его исследования имели большое значение для науки.

Тимирязев продолжал традиции русских демократов. Он был первым, кто популяризировал дарвинизм в России, и именно он перевел книги Дарвина на русский язык, был превосходным лектором, тщательно готовился к своим лекциям и читал их простым языком. Его занятия больше походили на дружескую беседу, чем на официальную лекцию.

Всю жизнь Тимирязев посвятил служению народу, науке. Он является основателем нового биологического направления в нашей стране, и его работы в области фотосинтеза хорошо известны как на родине, так и за рубежом.

В 1923 году был воздвигнут памятник Тимирязеву на одной из центральных улиц Москвы, и Московская сельскохозяйственная Академия носит его имя.

**34. Translate without a dictionary. Guess the meaning of unknown words from the context. Give the main idea of each paragraph.**

a) In general, genes are very stable. They replicate exactly and remain unchanged from one generation to another. They are capable of undergoing change, however, and these changes may result in modification of the gene's action. The geneticist recognizes this change in action in the phenotype. Once a mutation has taken place, the altered form of the gene is copied exactly, and if the change occurred in a germ cell or in a cell which will finally give rise to germ cells, it may be inherited and become a part of the genetic make-up of the population. The frequency with which mutations appear depends to some extent on environmental conditions. The study of mutations and how they arise can lead to a clearer understanding of what genes are and how they function. For these reasons it was indeed a great step forward when mutations in Drosophila were discovered.

b) With a good microscope, we can see that in the nucleus of-«very cell there are tiny particles that look like dots. These dots are made of a material called chromatin. The chromatin particles form threads. These are the threads that are usually to be found coiled and twisted inside the nucleus. These threads of chromatin are called chromosomes and they contain genes.

There must be something in the chromatin that decides what the offspring is going to look like. You know, of course, that a person has many different traits or features. Whatever controls these traits must be packed into the microscopic nucleus. Scientists believe that there are tiny-structures in the chromatin that control all the different traits. These structures, which are so small that they cannot be seen even under the microscope, are called genes.

Genes are extremely important. You have genes for all your body organs: for hair, skin and eye colour; for blood type and for intelligence. In fact, genes are responsible for almost all the features that make you look Afferent from anybody else. A single gene may even change your whole life. In the nucleus of every cell of your body there are about 20 000 genes all together, these genes do much to decide what you look like.

c) Scientists thought it would be interesting to make account of these chromosomes in the cell. It was found soon that each particular kind of animal or plant has its own definite number of chromosomes. Even the shape of each chromosome remains the same in all the cells. And when the cell divides, each chromosome divides lengthwise also. It divides in a manner that every gene in that chromosome also splits in two. In this manner, every cell in the body has the same number of chromosomes and the same gene.

**35. Give a written translation of the text using a dictionary.**

***Genetics***

The subdivision of biological science that deals with the inheritance of the individual is known as genetics. The primary observation on which this branch of knowledge is based is that individuals resemble their parents, and also their more remote ancestors, to a greater or lesser extent.

Modern genetic theory has grown out the chromosome theory of inheritance and its corollary, the theory of the gene. It holds that the information that determines a character of an individual is carried as a unit of inheritance, or gene, in deoxyribonucleic acid (DNA). DNA constitutes a portion of the chromosomes of all higher organisms and is present also in bacteria and most viruses.

Genetic theory futher holds that genes are arranged in a' linear order along the DNA molecule.

Each organism contains one complete set of genes, or a complete set of information in each cell.

The DNA molecule has the capacity to produce exact copies of itself, a process known as replication. The information carried by the DNA molecule from one generation to the next is expressed by its influence on protein synthesis. This accounts for the constancy of the characteristics inherited ~by **a** group of individuals descended from the same ancestor. However, changes can occur in the molecule. These are mutations, and individuals provide the variations upon which change and evolution depend.

**36. Translate the text into Russian and then back into English; compare your version with the original.**

In 1910 the professor of Columbia University Thomas Hunt Morgan, working in his laboratory noticed in one of his bottles a fly with white eyes. All the other flies had red eyes. He continued his observations and noticed that the flies bred from his white-eyed fly had also white eyes. Professor and his co-workers studied 15 million flies, and made a new discovery that living things consist of genes which pass from one generation to another. Sometimes mutations may happen. Over many years mutations pile up and after a long period of time the offspring begins to have quite new genes, that are different from their ancestors.

**37. Reproduce the text in your own words.**

Генетика начала свое развитие с работ Г. Менделя еще во второй половине XIX века. Однако только на рубеже XX века, а именно в 1900 году, его работы получили признание, и появилось новое направление в биологии – генетика. Дальнейшее развитие генетики обязано работам крупных ученых, как зарубежных, так и отечественных.

В 1927 г. Н. К. Кольцов поставил вопрос о молекулярной природе гена и развил матричную (matrix) теорию самоуправления хромосом. Эта работа положила начало молекулярной генетики. В 1953 г. Уотсон и Крик открыли физико-химическую организацию и генетическую сущность молекул ДНК, в которой записан (to record) генетический код (information). Оказалось, что гены в живых организмах подвержены изменениям под влиянием внешних условий. Это положило начало новому направлению – экспериментальному мутогенезу. Используя мутацию животных и растений, стало возможным выводить их новые виды.

В 1968 г. был впервые химически создан отдельный ген в лаборатории, В настоящее время ведутся работы по ферментативному синтезу отдельных генов. Введение вновь синтезированных генов в чужие для них клетки положило начало еще одному направлению в генетике – генетической инженерии:

Современная генетика в настоящее время вплотную подошла к лечению наследственных заболеваний, и медицинская генетика приобретает все большее значение.

**38. Translate the text with a dictionary.**

I. V. Michurin is known to be a famous selectionist and practical gardener in our country. His scientific legacy is immense. «We cannot wait for favours from nature. We must wrest them from her» – he used to say. Boldly remaking nature in the interest of man, Michurin evolved more than 300 new varieties of fruits and berries, flowers and decorative plants. Having moved southern plants far to the North he bred new varieties of fruits. For example, Michurin remade the warmth-loving grape, adapting it to the conditions of Leningrad and Kirov, the Moscow area, and many other central and northern regions, where it produces good yields. His efforts made possible fruit cultivation on a large scale in northerly areas and Siberia.

Problems of hybridization held an important place in his researches. Studying the complex biological phenomena manifested in hybridization Michurin developed new methods, not known before him either in biological science or in the practical work of plant or animal breeders. Of special significance for biology is Michurin's teaching about the mentor? Its substance consists of the following: if a young plant is to be grafted on an older one, it will acquire the properties of the mentor. The mentor method employed by him helped to breed new remarkable varieties of apples and many other valuable fruits.

The subjugating of the forces of nature to the will of man was the idea to which I. V. Michurin dedicated his entire life. This idea lives and triumphs in the deeds of the millions of scientists, and had become the foundation of agriculture in our country.

**39. Translate the text without a dictionary.**

Man has been engaged in breeding and selecting plants and animals for thousands of years. During that time he has been able to develop a great many varieties.

Breeders are always anxious to increase production. They try to get more and better varieties of berries from each bush, more milk per cow, and more eggs per chicken. In many cases, the breeder has found it possible to develop new varieties that resist high or low temperature and diseases.

They use three chief methods in the effort to increase quality and production. These are selection, crossbreading and the use of mutations.

The breeder tries most of all to understand the heredity of the animals and plants with which he works. He carries out many experiments to learn about the genes and how they are inherited. Then he tries to get a combination of genes that will give him the qualities he desires. Such experiments may be long, difficult and costly.

**40. Read the text and reproduce it.**

Michurin is well-known in the history of breeders. As a boy, he became interested in plants and his ability to recognize valuable traits soon became evident. He applied his marvelous powers of observation in developing new types of plants. He could detect traits that were not easily seen by others, and his great patience made it possible for him to carry on experiments that lasted for many years.

He often combined the traits of two different plants to make a new variety. He spent many hours carefully transferring pollen from one plant to the pistils of another. In this way he crossed a plum and an apricot to produce a new fruit.

**41. Translate the text in writing with a dictionary paying attention to infinitive constructions (you are given 30 min.).**

a) The units of living matter cover a wide range of sizes. A few sorts of cells are large enough to be seen by the unaided eye; to be seen, they must be at least 0.1 millimeters, or 100 microns, in one dimension. Many animal eggs, which are single cells, are this large. Among the few plant cells which are this large are the cells in the fleshy portion of the watermelon. Most cells are smaller than this and are said to be microscopic in size; that is, within, the range of an ordinary light microscope. Below this range is another into which fall the viruses. Particles of known viruses generally occupy the size range 100 to 1000 A or 10 to 100 mill microns. Thus, viruses are individually invisible in the light microscope and are said to be submicroscopic, although they can be visualized with the electron microscope. Within this same size range fall several aggregations of molecules which make up the structural components of many types of cells. Between the viruses which have not been demonstrated to have cellular organization, and the bacteria, which have been demonstrated to have a characteristic type of cellular organization, falls a group of organisms known as the Rickettsias. The Rickettsia are considered by some investigators to be cellular; by others to be noncellular and perhaps similar to the viruses.

b) The chemical analysis of plants is to show what the plant contains, what food it requires; the chemical analysis of the soil is to show what the tatter lacks; a comparison of the results of the first analysis with those of the second will give an answer as to how soil fertility is to be raised.

The result of this analysis cannot be considered complete unless it is concluded by a summarized synthesis. Besides, both the physical and the chemical analysis of the soil are needed. But neither the one nor the other taken separately, nor both together, can solve the problem of soil fertility, still less the problem of the development of fertility, of the development of soils. This evolution can be understood only if we study soil as a developing integral whole governed by the activity of plant and animal organisms. We cannot imagine either the origin or the formation of soil without the direct participation of plants. Plant physiology is the principal basis of all the conclusions of agricultural science. If the soils of today are to be cleared of plants for a number of years it will rapidly lose its fertility and become barren dust.

**43. Reproduce in your own words.**

Задачей селекции является создание высокопродуктивных и однородных по наследственным свойствам организмов. Селекция – это практические приемы и методы выведения новых и улучшение существующих сортов растений и животных. Теоретической основой селекции является генетика. Получение селекционных сортов основано на двух свойствах, присущих всем живым организмам, – на изменчивости и наследственности.

Процесс выведения новых сортов подразделяется на следующий стадии:

1) изучение исходного материала;

2) выделение из этого материала выдающихся форм;

3) всестороннее сравнительное изучение выдающихся форм;

4) районирование сортов, то есть определение районов, для которых тот или иной сорт оказывается наилучшим.

В тех случаях, когда методом отбора нельзя получить сорта с комплексом необходимых хозяйственных свойств, применяют метод гибридизации разных сортов или даже разных видов растений, у которых нужные свойства имеются порознь. При скрещивании различных сортов в пределах видов получают плодовитые гибриды. Среди них на основе закона независимого комбинирования наследственных факторов (генов) могут возникнуть новые сочетания, которые и выделяются в последующих поколениях.

Большая заслуга в разработке методов селекции плодово-ягодных культур принадлежит И. В. Мичурину. И. В. Мичурин всю жизнь занимался практическим садоводством и работал над выращиванием разных видов растений и выведением новых сортов фруктов и цветов. Комбинируя теплолюбивые фрукты с зимостойкими сортами, он получал качественно новые сорта. Он разработал методы скрещивания растений и показал, что изменение законов природы находится во власти человека. Советское правительство высоко оценило работы И. В. Мичурина. Он был награжден орденом Ленина за то, что создал более 300 новых сортов растений, ягод, цветов.

**44. Read and translate the text without a dictionary.**

***Robert Koch***

A German scientist Robert Koch proved that a human disease was caused by bacteria. Koch found rod-shaped bacteria in large numbers in the blood of animals suffering from a disease called anthrax. These bacteria had been seen before, but no one could prove them to be the cause of the infection. Most scientists of the time believed them to be in blood merely by accident Koch grew these bacteria outside the body of the animal in pure unmixed form. He watched them grow under the microscope. Then he injected these bacteria into mice. The mice died of anthrax and in their blood were great numbers of the same bacteria. The bacteria could be grown outside the body of the mouse once again, and again they could cause anthrax. Thus Koch proved bacteria to be the cause of anthrax. After Koch's discovery was made public, scientists made careful studies of people suffering from infectious diseases. Soon other serious illnesses were proved to be caused by bacteria. Koch himself discovered the bacteria that cause tuberculosis.

**45. Read and translate the text without a dictionary.**

***Joseph Lister***

A hundred years ago, about half the people who underwent surgical operations died. In some hospitals the percentage was much higher, approaching 90%. These people, for the most part, died as a result of infections following operations.

Joseph Lister, professor of surgery at the University of Glasgow, was much concerned about this condition. After reading of the work of Louis Pasteur, he wondered if the infection that killed people after surgery might not be a kind of fermentation caused by bacteria.

The next time he operated, he painted the wound with carbolic acid and soaked the instruments in the same substance. He also boiled the cloth he used for a dressing. The man lived, what is more remarkable, there was no infection.

Encouraged by this success, Lister made other changes in standard operating room procedures. Instead of washing .his hands after he operated he washed them before. He wore a clean linen apron instead of the dirty old coat covered with the blood and pus of previous operations, the uniform of the surgeon of that day. Instead of wearing the needle and thread stuck in the lapel of his coat, he boiled them before using them. He sprayed the air with carbolic acid to kill the bacteria that Pasteur had found there.

Lister's results were unbelievable – most of his patients lived. The frightful infection known as «hospital gangrene» almost disappeared from his hospital. He had introduced to the world the technique of aseptic surgery, that is, surgery without bacteria. Thanks to the pioneering of Joseph Lister, infection following surgical operations is a rare thing today.

**46. Read and translate the text with a dictionary in writing. (You are given 30 min.)**

***Mechnikov***

One couldn't expect to keep all deadly micro-organisms away from human beings at all times, sooner or later, exposure to disease was certain. What then?

The body had ways of fighting micro-organisms, since it could recover from infections spontaneously. In 1884 the Russian biologist Ilya Mechnikov (1845-1916), found a dramatic example of such «counterbacterial warfare». He was able to show that the white corpuscles of the blood, equipped with the capacity to leave the blood vessels if necessary, flocked to the site of infections or bacterial invasion. What followed was very much like a battle between bacteria and white corpuscles, with the latter not necessarily always winning, but winning often enough to do a great deal of good.

Yet there had to be more subtle antibacterial weapons, too, since in case of many diseases, recovery from one attack meant immunity thereafter, although no visible changes in the body could be found. A logical explanation for this was that the body had developed some molecule (an antibody) which could be-used to kill an invading micro-organism or neutralize its effect. This would explain the effect of vaccination, since the body might have developed an antibody against the cowpox micro-organism and found it usable against the very similar smallpox micro-organism.

**47. Read and translate the texts and give the main points of them.**

a) To get rid of reeds and other «enemy» water-plants in waterways has been a problem since ancient times. Water-plants interfere with the circulation, of water in reservoirs and in irrigation systems; they interfere with navigation in canals and rivers. Hydroelectric power plants lose many kilowatt-hours of electricity due to the growth of plants in the water supply systems. This «enemy» has been attacked in many ways, but as a rule, the means used have been complicated, expensive and not very effective.

A solution has now been found in an unexpected source. A fish called «White Amour» was brought from the Far East to other parts Russia, where it is not usually

found. This fish can grow to a metre in length, and can weigh more than thirty kilograms. Its food is water-plants, and every day the White Amour eats as many kilograms of water-plants as the weight of its own body, kilogram for kilogram. One year after the White Amour was put into the water supply system of Moscow power-plant, the fish had eaten so many of the «enemy» water-plants that the water supply became normal again. Besides being «working fish» the White Amour is a very tasty fish. When it has grown large on the plants in a water system it can be caught and eaten. White Amour is now used to get rid of water plants in irrigation canals in Central Asia. Scientists are now trying to find other fish that can be used for the same purpose.

b) One early spring day a man stood on the shore of a small lake near Kingsville, Ontario, not far from the city of Detroit, Michigan. Suddenly hundreds of wild geese in graceful formation approached from the south. When they reached the lake, they dropped swiftly downward and alighted upon the water before him. Every year they stopped because they knew that the lake would afford a haven of safety and rest.

Jack Miner was a brick manufacturer. Year after year he observed birds alighting on pond in his brickyard and noted their need of food and protection. Finally in 1904 he conceived the idea of building a bird sanctuary and converted the pond into lake. Then he clipped the wings of two wild geese and scattered corn about for food. The two geese and the corn attracted other geese.

The first spring eleven geese came. The second year the number increased to thirty-three, and the third year to three hundred. Today geese come by thousands.

Besides geese, many other kinds of birds visit the sanctuary, some having changed their original routes of migration to include it in their route. These birds come year after year because they find food and protection. The sanctuary, now known as the Miner Bird Sanctuary, is supported by the Canadian government. It includes a number of lakes and is one of the greatest sanctuaries in the world. Each year it attracts numerous tourists, sometimes as many as ten or fifteen thousand a day.

**48. Translate the text without a dictionary. Suggest a suitable title for it and give the main points of the text in writing.**

Through the years some interesting relationships among organisms have developed. Some of these relationships are so definite that the organisms concerned can live in no other way and when one dies, the other dies also. In other cases, the relationships are more flexible.

The sum total of all these interrelations of living things .is called the balance of life, or balance of nature. This balance can be upset by changing the environment or by changing the population of living things in the environment. In any event, a new balance is soon established.

Man has been more active in upsetting the balance of nature than any other factor.

We know today that the thoughtless destruction of wild life may result in a serious upset in the balance of nature. Every plant and animal influences the fives of many other living things in the same area. They live in a delicate state of balance with one another. It is unwise to disturb this balance without giving thought to the results.

The preservation of wildlife is a duty of every citizen. If you catch a fish that is below the legal length, you should wet your hands, carefully remove the hook and

put the fish back into the water. Never take more than your legal limit. Observe the laws passed to protect rare wild flowers, since they rapidly wither and lose their beauty. Leave them as they are for others to enjoy.

**49. Read and translate the text in writing. Suggest a suitable title for it.**

What were the influential forces at work on Pavlov to bring him to the decision to investigate psychic activity by the objective method of science? There were, of course, many factors. There was his long experience as a most successful experimental scientist, in the fields of blood circulation and digestion. Further his career thus far in work on the lower nervous system was his concern and interest. Also, no doubt, the fact that brain physiology was in a blind alley, as much as circulation of the blood and digestion had been, posed an irresistible challenge to him.

But perhaps the single most important influence was his familiarity with the works of I. M. Sechenov, and more especially «The Reflexes of the Brain». Here, in this book, Pavlov had not only set an example of courage in the face of persecution, but a treatment of the same subject, and important ground-breaking for a physiology of the brain.

That Sechenov and his work played a major role in Pavlov's decision is attested to by Pavlov himself: «And I take it that the most important motive for my decision, even though an unconscious one, arose out of the impression made upon me during my youth by the monograph of I. M. Sechenov, the father of Russian physiology, entitled «Reflexes of the Brain» and published in 1863». In this book, a brilliant attempt was made, altogether extraordinary for that time, to represent our world from the standpoint of pure physiology.

**50. Read and translate the text without a dictionary.**

At the age of 78 Pavlov was taken seriously ill. He had to undergo an operation. His age and the seriousness of the operation affected his heart. Pavlov's heart had never known tiredness, and now it was beginning to wear out.

Nevertheless the great scientist could not miss the opportunity for another experiment. With the help of a trained assistant he made some careful observations of his organism and soon a paper appeared under the modest title «Post Operation Neurosis of the Heart, Analyzed-by the Patient Himseli. I.P.P.»

He didn't stop his work, even on his death-bed, he studied his illness, made his own diagnosis on the basis of his activities, and discussed his observations aloud. The great Russian scientist knew that the end approached. He called in a nerve specialist to analyse his condition with him. He looked upon his Death as his last experiment.

**51. Translate the text into Russian, then back into English; compare your version with the original.**

In the village of Pavlovo, near Leningrad, there is a scientific «town» founded by the great physiologist. It is a part of the institute, in which research is under way in the field of the genetics of higher nervous activity, comparative physiology and other subjects.

The workers of the institute are doing successful research on various important problems of modern physiology, one of them being the problem of the principal laws

governing the higher nervous activity of man and animals in normal and pathological conditions.

The new data obtained at the institute has proved that the selective systematism of cerebral activity is not characteristic of man alone – the opinion held before – but also of the higher vertebrates.

**52. Read the text and reproduce it.**

Sechenov lived for forty-two years after the publication of his famous book «Reflexes of the Brain». Much of that time was passed as Professor of Physiology at Moscow University. He also taught without pay several courses at the Women's Pedagogical Society and at a school for factory workers. Both these teaching tasks were part of his struggle for extending education in tzarist Russia to women and to workers. These years were rich in scientific work, lecturing, and publishing papers in the professional journals. Through his laboratory work and his teaching he won for himself the unofficial title of father of Russian Physiology.

## Unit 3
## TEXTS FOR HOME READING

### Text 1. THE SCIENCE OF BIOLOGY

Biology is the science of living organisms. It is concerned with their nature, functions, reproduction, and place in their environment. It is a ramifying science, but it aims to be a precise one. It is rooted in physics and chemistry and many of its interpretations are made in terms of these sciences and of mathematics. It is bound closely with geology and meteorology, and applications of its principles are found in anthropology, psychology, sociology, agriculture, medicine, industry, and indeed, in everyday living. Inasmuch as one of its ultimate aims is thorough understanding of living organisms including man, biology is entitled to be called the most vital of the sciences.

COMPOSITION OF LIVING BODIES. Chemical analyses show that living materials consist of carbon, hydrogen, oxygen, nitrogen, sulfur, phosphorus, potassium, iron, and magnesium. In addition, they usually contain sodium, chlorine, and lesser amounts of such elements as manganese, copper, iodine and fluorine. Everything can be identified. There is no residue of unidentifiable stuff. But the elements present in living matter are all found in abundance in mineral deposits, in sea water, or in the atmosphere. Hence we can conclude that there is nothing peculiar in the elemental composition of living matter.

But what of the way in which these elemental blocks are put together? We know, for instance, that hydrogen and oxygen combined in one proportion ($H_2O$) constitute water, a specific substance; in another ($H_2O_2$), hydrogen peroxide has quite different properties, associated with their differences in composition. Is living matter distinguished from nonliving matter by its chemical organization? With reference to many of chemical compounds found in living matter the answer to this question is no. With reference to the sum total of the compounds which together make up any living body the answer is yes.

A major part, 65 to 90 percent, of every living body is composed of hydrogen and oxygen combined as water. Water is an inorganic substance, chemically simple and obviously not confined to living organisms. The bodies of plants and animals contain numerous other inorganic substances – acids, bases, and salts. None of them differ from the acids, bases, and salts with which the inorganic chemist works daily in his laboratory.

Other substances, the so-called carbon or organic compounds, are restricted, in nature, to living bodies or the products of living bodies. They include the carbohydrates, fats, and proteins. All contain carbon, hydrogen, and oxygen. In addition, the proteins contain nitrogen and often sulfur and other elements.

The carbohydrates are generally considered the simplest organic substances. Their structure is adequately known and many of them can be synthesized. In living organisms they are important as energy compounds.

Nearly all the energy used by living organisms, plant, and animal, is light energy derived from the sun. This light energy is converted to other energy forms by a process called photosynthesis. It is in carbohydrates that green plants first store this energy. It is primarily in carbohydrates that the energy is distributed to all parts of the plant, and it is from carbohydrates that much of the energy used by animals is obtained.

Fats resemble carbohydrates in composition but are chemically more complex and contain more stored energy. Like the carbohydrates, many fats can be synthesized in the laboratory.

Proteins differ considerably from fats and carbohydrates. Chemically they are much more complicated than all except a few carbohydrates and fats. So far no proteins have been synthesized. Proteins are more closely related to certain of the activities which characterize the living state than are the carbohydrates and fats. Proteins have a specific character which the other organic compounds lack. Whereas the same carbohydrates and fats are found in thousands of different kinds of organisms, among the proteins there is a high degree of specificity. Each protein tends to be characteristic of only one kind of organism, sometimes of only certain organs or of particular stages in development. Hence, the differences among living things seem to be in some way correlated with differences in the nature of their proteins.

SUBDIVISIONS OF BIOLOGY. We shall consider plants and animals together, both in the discussion of fundamental biological principles and with respect to their natural associations with each other. They will be treated separately when this appears desirable for purposes of emphasizing basic differences and when the problems of approach are different. Plants and animals are, similar in their fundamental composition. They are made up of the same group of elements combined in essentially the same way. Both are composed of cells as the fundamental structural units, but their tissue systems, organ systems, and general construction are very different. Animals are usually more complicated than plants, and with this greater structural complexity are associated with more highly developed coordination and greater activity. Plants lack the power of locomotion; animals have various means of moving about. The nutritional activity of a plant is circumscribed by its inability to move; that of an animal is fairly broad. This difference is associated with the expenditure of far more energy

by animals and with more intricate mechanisms for the liberation and use of energy. Partly as a result of such differences, evolution has brought about greater diversity among animals, the types of animals being much widely different than the types of plants.

Biology may be divided in either of two ways, depending upon whether the emphasis is placed on type of organisms or on processes, structures, and functions. With the first system there are two principal divisions: botany, which deals with plants, and zoology, which deals with animals.

Botany may be subdivided as follows:

Bacteriology – study of bacteria.

Mycology – study- of fungi.

Algology (sometimes called phycology) – study of algae.

Bryology – study of mosses.

Pteridology – study of ferns.

All these branches may be grouped together as cryptogamic botany, the study of plants which do not produce seed. Study of the seed plants (actually two groups – the gym-nosperms, which bear cones, and the angiosperms, which bear flowers) covers a single field, phanerogamic botany. Zoology is similarly divided as follows:

Protozoology – study of single-celled animals.

Entomology – study of insects.

Ichthyology – study of fishes.

Herpetology – study of amphibians and reptiles.

Ornithology – study of birds.

Mammalogy – study of mammals.

Anthropology – study of man (with reference to physical rather than cultural characteristics).

This botany-zoology system grew up naturally as biological science developed, the emphasis during its early years being placed on structure and relationships. As it became more arid more of a precise experimental science and emphasis was given to finer aspects of structure and function, another system of classification based upon the parts or processes studied came into use. In this system there are such subdivisions as the following:

Cytology – study of cells.

Histology – study of tissues.

Anatomy – study of internal structure as revealed by dissection.

Morphology – study of gross structure, the organism viewed as a whole.

Physiology – study of functions and processes.

Genetics – study of heredity and variation.

Pathology – study of aberrant conditions and diseases and their effects.

Evolution – study of origin and changes in species.

Paleontology – study of fossil organisms.

Taxonomy – classification of organisms.

Ecology – study of organism environment interrelations.

Psychology (experimental psychology) – study of the animal mind.

Examples of more specialized fields that fall within this same general classification are:

Embryology – study of individual development.

Endocrinology – study of the endocrine gland system in animals.

Parasitology – study of parasitism.

As the emphasis on these finer studies increased, biology as an exact science has become more dependent on the other exact sciences for interpretation of its data and their significance. Biochemistry, a division of chemistry, deals with the chemistry of living organisms and their products. Biophysics has as its subject matter the physics involved in the structure, development and functioning of living organisms. Biometrics is a special field of mathematics concerned with the analysis of biological data.

We must recognize that any classification of biology or any other science into branches or subsciences is purely arbitrary and has value only in providing for the presentation of facts. It is impossible to obtain a true idea of plants and their significance without a parallel consideration of animals. It is equally impossible to study structure effectively without at the same time studying function, or to study distribution without studying inheritance. We shall consider what have come to be recognized as main principles concerning the organization of functioning, distribution, and interrelation of living organism. In doing this we shall break down the whole subject and deal with specific groups or processes when doing so will lend clarity to the presentation.

## Basic life functions

The characteristic organization of living creatures is inseparable from those functions that are the distinguishing marks of life. One of the most significant of these is photosynthesis, the process by which green plants, with adequate light, manufacture carbohydrates. These carbohydrates, important as energy sources, are the initial sources of the organic substances from which most living organisms are built. Plants store them or convert them into other chemical compounds. Animals derive their building materials and their energy directly or indirectly from plants. Although photosynthesis is a function of green plants – indeed, of only certain cells in these plants – it is one of the most important of all biological processes.

A universal life process is respiration, by which the energy in chemical compounds is released for use in the activities of protoplasm – in the maintenance of cells and tissues, in the formation of new cells and tissues, and in the processes involved in their breakdown.

All organisms are characterized by growth and reproduction. Growth may be defined in a general way as a simple increase in mass, but the growth of an organism usually includes increase in the number and size of the cell units and progressive development of the various parts of the organism. Growth ceases and the individual is said to be mature. All organisms can reproduce and thus increase their number – reproduction, which is essential to the perpetuation of each type of organism, usually takes place during maturity.

Irritability – the capacity to react to stimuli – is characteristic of all living organisms. Upon this capacity to react to such stimuli as light, temperature, contact and specific chemicals rests the ability of the organism to adjust itself to its environment.

To define the nature of living material we must consider not only the functions and characteristics of living things, but also the environment in which the organisms exist. No plant or animal can live apart from this environment or even far out of adjustment with it.

LIVING ORGANISMS AND THEIR ENVIRONMENT – An organism's surroundings and all the factors which influence it constitute its environment. The complex relations between organisms and their environment can be seen in a very brief consideration of food supply.

The green plants are at the base of the system of food relations in the organic world. They take from their surroundings only simple inorganic materials – water, carbon dioxide, oxygen, inorganic nitrogen, and various mineral salts. From these simple substances plants build carbohydrates, fats, and proteins. With the exception of a few bacteria and molds, all other organisms depend upon the green plants for their food supply. Herbivorous animals consume plants directly. Carnivorous animals eat other animals which may in turn be herbivorous. Some are omnivorous; that is, they eat both plants and other animals. The types of plants in a particular environment determine to a large extent what kinds of animals can inhabit that environment. As we shall see later, the presence of a particular organism in a given environment may influence all the others found there. The basic physical and chemical factors in the environment are also of the utmost importance.

Oxygen is an absolute requirement for most organisms; it is likewise abundant in most surroundings. Land-dwelling species obtain oxygen from the air; most aquatic species utilize the oxygen dissolved in water; If as sometimes happens in experimental or otherwise limited environments, the oxygen supply of organisms is cut off the organisms will die.

Quite as important as oxygen is water which is a universal component of protoplasm. It provides the essential medium for the chemical processes of life and the transport of materials. The amount of water available determines what types of organisms will occur in an environment, how fast they will grow, and the rate of many of their basic life processes.

Carbon dioxide in the environment is essential for photosynthesis. If either carbon dioxide or inorganic nitrogen is absent or deficient, the growth of photosynthetic plants is limited or prevented. This, in turn, affects the animal population.

Equally important are, such physical factors as light temperature, and gravity. Light furnishes, through photosynthesis, virtually all the energy of the Organic world. Furthermore, it has many direct influences, such as those on the growth patterns and flowering habits of plants and the migratory and sex cycles of some animals.

In general, life processes cease at about the freezing point of water (0°C or 32°F) and at about 80°C or 176°F (the boiling point of water is 100°C or 212°F). A few kinds of plants and animals can endure lower or higher temperatures, but for optimum development most organisms have relatively narrow temperature ranges. Some plants and animals are characteristic of low-temperature zones; others, of high-temperature zones. The daily and seasonal temperature fluctuations are important, too, in the growth .and developmental processes of both plants and animals and in the feeding, mating and migratory habits of many animals.

Such a fixed environmental factor as gravity may control both form and function. Most plants and animals are directly responsive to gravity. Roots of plants normally respond positively, that is, they grow downward; shoots respond negatively – they grow upward. Balance in an animal is a gravitational response, and the size of an animal is in part controlled by the relation between its structure and gravity.

All these and many other factors are aspects of an organism's environment. Over a long period of time plants and animals may become modified and thus adapted to particular features of an environment. For example, aquatic plants and animals have much less structural rigidity than terrestrial types; they need less support in the buoyant water. Active aquatic animals such as fish are streamlined and move rapidly against the resistance of the water. Birds are similarly streamlined for easier movement against the resistance of air. Birds have another adaptation in their light, hollow bones which result in light body weight.

Similar adaptations occur with respect to temperature and moisture conditions. Thick layers of fat and heavy coats of fur characterize many animals in the low-temperature regions. The leaves of plants that grow in hot, dry regions are often covered by thick deposits of wax that reduce the water lost by evaporation.

Colour phenomena of several types are generally considered to be adaptations. Numerous animals, from tiny insects to polar bears, have camouflaging colours at one time or another. Foliage dwellers may be green, ground dwellers brown or gray.

Many animals have hard shells, spines, or other specialized structures which afford them protection against natural enemies that inhabit their environment. Such characteristics have obvious survival values.

Because of their relation to the factors in their physical environment and to each other, the organisms of the world are tied together in a very complex pattern. One type frequently depends upon another for food, protection, proper conditions for growth and development.

I. Make up a plan of the text using questions.

II. Give a short summary of the text using your questions.

III. Discuss the following questions with your fellow students:

1. What is the composition of living bodies? What is the way in which the elements are put together?

2. Is living matter distinguished from non-living matter by its chemical composition?

3. What do fats resemble in composition?

4. Do proteins differ considerably from fats and carbohydrates?

5. What divisions of biology do you know?

## Text 2. CHARLES DARWIN

Charles Darwin brought the idea of organic evolution sharply to people's attention. It was he who proposed a theory of how and why one species developed from another. In 1859 his great book The Origin of Species was published, and after that people's whole outlook on nature seemed to change.

It was rather strange that Darwin should have worked out the theory of organic evolution, for at first he believed in «special creation» as firmly as anyone could. In

the beginning he had no thought of being a naturalist. His father in fact, was quite discouraged with him, for in his early years he seemed to care for nothing but horse-back-riding and pheasant-shooting. His father feared that he would become nothing but an idle sportsman. Finally, however, Darwin agreed to study at the medical school of the University of Edinburgh, for both his father and his grandfather were doctors. But the lectures at the medical school appeared to him dull, and he could not bear the sight of operations: they were administered in those days without anesthetics. So he left the medical school.

After that – and there was a good deal of argument first – he agreed to study for the ministry. In thought he might become a country minister. He loved country life, and had begun collections of beetles and butterflies. Reluctantly, then, he enrolled as a theological student at Cambridge. And there he met Professor John Stevens Henslow, the geologist and botanist.

Almost immediately Henslow and Charles Darwin became fast friends. They were seen walking together so often that the students at Cambridge called Darwin «the man who walks with Henslow».

It was during those years', and under Henslow's influence, that Darwin began to read the works of the great naturalists. He read Alexander von Humboldt's Personal Narrative of Travels to the Equinoctial Regions of America and longed to set foot in the new world. He read Sir John Herschel's Introduction to the Study of Natural Philosophy and dreamed of adding something humble but substantial perhaps to what he called a little pompously, «the noble structure of natural science».

His opportunity to add to that structure came much more quickly than he anticipated. In the late summer of 1831, the HMS Beagle was to make a cruise around the world for purposes of mapping and .scientific observation. The captain, «Robert Fitzroy», wanted a scientist to go on the expedition – «a scientific person to examine the land».

Professor Henslow recommended Charles Darwin for the post, and Darwin was filled with excitement. To go to the equinoctial region of America as Von Humboldt had done, to have a chance to examine minerals and wild life in regions where he had never been before, seemed to him the opportunity of his life.

But his father objected. They boy ought to finish his theological course, he said. He had wasted time enough. Charles Darwin's uncle, Josiah Wedgwood, who was the owner of the famous Wedgwood potteries, saw the youth's point of view. He had his horses harnessed to his carriage and drove more than thirty miles to see the elder Darwin. In the end the permission was given, and Charles Darwin set off for the Beagle.

But now he encountered another difficulty. The captain of the vessel hesitated to accept him. He doubted, he said, «whether a man with such a shaped nose could possess sufficient energy and determination for the voyage».

«How strange!» Charles Darwin said years later. «I became a naturalist only because my uncle was willing to drive thirty miles to see my father and because the captain finally decided he did not object to the shape of my nose».

His Majesty's ship Beagle, a ten-ton brig, sailed out of Devonport on the twenty-seventh of December, 1831. She was bound for Patagonia, and thence through the

straits of Tierra del Fuego, and so on around the world, «It was the most important event in my life», Charles Darwin wrote years later. The little brig pushed out across the Atlantic, and soon was encountering rough seas, so that the young naturalist, lying in his bunk, was miserable with seasickness. This sickness was to plague him off and on, whenever the vessel rocked, throughout the five years of the voyage.

They landed on the South American coast, and Darwin began his collections immediately. Soon he had mineral, shells, and plants arranged systematically in the small room behind the mast where he also kept his book and instruments. Since the space allotted him was so small, he decided not to collect many specimens but to choose each one as carefully as he could and classify it in as orderly a way as possible.

Day after day the vessel sailed along the South American coast, and the young naturalist, who had never been out of England before, watched the unfolding panorama of the South American shore – the dark Brazilian forests with their rich life of birds, reptiles, and animals; the high grass of the pampas in Argentina; the bleak, rocky heights of Patagonia, where the wind never stopped blowing. For though the Beagle was to push on across the Pacific and into the South Seas, the greater part of the voyage was spent along the coast of South America.

As they sailed down the coast Darwin went ashore at frequent intervals to study the land, the mud, the rocks, the fossil bones, the fungi in the dark forests, the ostrich on the high plains, the flamingo that fed on the worms of the salt lakes of Argentina.

When the Beagle lay over for a month at one of the Galapagos Islands, five hundred miles from the South American coast, strange and disturbing thoughts began to enter Charles Darwin's mind. On this island, which was composed of volcanic lava recently cast up from the sea, he found animals that were certainly of the same genera as those on the mainland of South America. Yet they were not the same; they seemed to be of different species. And as the Beagle moved on, visiting one island after another, he found that each island had its' separate species of plants and animals. Mow, he thought, watching the rim of the ocean as the little vessel pushed across the sea, why had a separate species been created for each small island? The making of such a multiplicity of species seemed at least irrational. Why were there thousands of different species on those islands? Why did they belong to the genera of South America, which were miles away? Animals might perhaps have swum across. But if this was true, why was each of the species on the islands a little different from those on the mainland?

The problem troubled him. Characteristically he said nothing about it; however, in a small yellow notebook he started to make notes on his observations.

After he reached England again he wrote to Joseph Dalton Hooker, the botanist: «At last gleams of light have come, and I am almost convinced (quite contrary to the opinion I started with) that species are not (it is like confessing a murder) immutable.»

But the confession of the «murder» was later. For the present he was simply examining the facts.

Finally the Beagle docked at Falmouth, October 2, 1836, and Darwin, who had suffered from seasickness almost every day of the five-year voyage, found himself on firm land again. The voyage was over.

Darwin's letters and part of his specimens had arrived in England before him, and his reputation as a naturalist was now well established. The scientists greeted him enthusiastically.

But Charles Darwin wanted to get away from all of them. After three years in London, he married his first cousin, Hannah Wedgwood, and they bought a roomy, comfortable house with a garden at Down, a small town in Kent. There he was to live and work for the rest of his life.

The problem that Charles Darwin wanted to study was the one that had perplexed him first on board the Beagle. Had God whose «special creation» he had taken so much for granted really created so many thousands of species, all of them so nearly alike, yet different? Or was it possible that the idea of special creation might be wrong? Was there some sort of relationship between the species? He had heard of the work of Lamarck, but he thought nothing of it – «rubbish» he called it. Cuvier's idea of catastrophes seemed to him foolish too.

He decided that he might get some help by studying domestic animals, since these were near at hand and easy to observe. He began a correspondence with a large number of breeders and started to breed different races of pigeons himself. He found that man could certainly modify the breeds of dogs, of cows, of pigeons. There must be some force in nature that works the same way, he thought. But what was it?

Darwin thought. Ail organisms must increase at an enormous rate. Linnaeus had said somewhere that if a plant produced two seeds each year, and if each of these produced only two seeds in the same way, a million plants would be descended from the first one in only twenty years. Darwin kept thinking of that. And take animals, he argued. An elephant is a very slow breeder. But if a pair of elephants produce six young in the course of their lives, and each of these does likewise, in seven hundred and fifty years there will be nineteen million elephants on the earth! They would have a struggle to keep alive, he said.

This, then, might be the answer, he thought – a continual struggle to exist. But granted, as he could easily observe, that every member of a species is not exactly like every other, granted that there are some variations among them, what determines which ones will survive? What determines which plants or birds or animals will live and which will die off? How is the balance so beautifully kept that the world is never overrun with elephants or stifled with oak trees?

The answer he found to his problem came to him slowly, as he sat in his comfortable library with its book-lined walls, as he walked through his garden at Down, as he watched his cattle cropping the grass in his pastures.

He could not tell exactly why there was a slight variation in the offspring of each plant or animal. That slight variation will «provide a grand and hitherto untrodden field of investigation», he said. But it is certain that some green beetles are a little greener than others; some swallows have stronger wings than others; some deer are quicker to hear the sound of danger. And among these, those that are best fitted to adapt themselves to their environment survive and reproduce their kind, while the others die off. By piling up variations in one direction over long ages of time, new species are formed.

The idea of special creation now seemed like an idle dream to him. As he walked through his fields, often accompanied by his terrier Folly, he examined plant and animal, bird and insect, considering his theory as he went along.

The years went by, he was still testing, examining. He wanted to be sure of his facts; he wanted to accumulate scores of facts.

In 1844 he wrote out in pencil a brief statement of his new theory and showed it to a few friends. They urged him to hasten to publish it. But he said there were more data that must be collected: he wanted to be so sure that he was right.

In 1859 Darwin published his famous book «The Origin of Species». And it was followed in 1871 by another book, called «The Descent of Man». In the latter book he applied the doctrine of the survival of the fittest to human beings, and drew the conclusion that «man is descended from some less highly organized form».

The uproar that followed the publication of Darwin's theories must have been heard even in the quiet garden of the house at Down. For most people are conservative and do not like to see their well-established ideas upset.

He grew to be an old man, who walked about his garden in a long black cloak, his beard snowy white, but his gray eyes still keen beneath their overhanging brows.

He died in 1882, and his countrymen took his body to Westminster Abbey, where they buried him beside Sir Isaac Newton.

I. Give a short summary of the text using active vocabulary.

II. Discuss the following questions with your fellow students:

1. What do you know of Charles' childhood?
2. What countries and islands did the Beagle visit? What led to a constant fight for life in Darwin's opinion?
3. When was his book «The Origin of Species» published?
4. What did he state in his book?
5. What did he think about the different species of plants and animals?
6. Why did the animals and plants on the islands change?

## Text 3. THE WORLD OF THE DOLPHIN

A good deal has been written about these animals which look so, very much like fish.

What drives the numerous researchers in many countries to attempt to penetrate the «world of the dolphin», to set up new laboratories, build new instruments and to put forward new hypotheses?

First of all, it must be said that this interest is not the outcome of some mass hypnosis, but is a conscious attempt to find out how it happened that a mammal managed to conquer the ocean and to populate it from the Arctic to the Antarctic, and from the surface down to depths of hundreds of metres. It is necessary to find the answer to this riddle, for the time is coming when man will concentrate on mastering the ocean depths, on the same scale as he is now trying to conquer outer space.

The study of the dolphin’s behaviour has its philosophical aspect, as well as the purely practical results. The dolphins, for example, possess a well-developed brain, communication signs, and a complex pattern congregation, which leads some researchers to declare that the dolphins are on a par with humans in intellectual development, or are even more advanced than man, whereas others maintain that these ce-

taceans are ordinary animals, which respond well to experiments. This leads to the argument about the philosophical criteria of intelligence, about the variety of expressions of intelligence, about the stages in the development of consciousness, about the possibility of man making contact with some other section of the animal kingdom, and about the responsibility this places on human beings.

Soviet researchers of different specialties are making thorough studies of dolphins.

THE DOLPHIN FAMILY. Research into the inter-relations within the school of dolphins provides grounds for supposing that their «social» system is matriarchal. We have observed, for instance, in one- species of Arctic white dolphins how an old female – the elder of the school – was surrounded by her offspring grandchildren and great-grandchildren of both sexes and of all ages up to the 11th generation.

The dolphin's gregarious instinct is so strong that isolation leads to a deep and persistent depression. The animal loses its appetite completely, as well as all interest in its environment. This can last a day or two, or even a week, and if there is no way of distracting the animal or of establishing contact with it, then it has to be reinstalled in the school or it will perish.

This affinity is most evident in young dolphins, but on the other hand, the trainers manage to establish contact with them more easily and quickly.

The affinity between mothers and their young is not restricted to the suckling period which may continue for 6-8 months. The mother will recognize its offspring among other dolphins even after several years of separation. This is probably due to a number of factors, the more important among them being the individual peculiarities of signals emitted by each animal, its own, so to speak, «personal» tune. We humans also recognize the voices of people we know by their timbre, intonation, tempo, and so on.

It has also been established by experiment that domination by one or another dolphin within the school is almost absent if the conditions in captivity are favourable. In this case groups of 2-4 dolphins are formed, apparently according to similarity of temperament and interests. These groups are very stable and dissolve only during breeding time. On the other hand, when abnormal situations arise, there emerges one dominating mammal.

Another form of domination is expressed in the management of the school. Among the bottle-nosed two old females played the part of leaders. At first when attempts were made to take some dolphin out of the school all the animals would bunch into a dense group and only the two old females would swim around its perimeter. This was a sort of a warning. As soon as a man began to approach, «to violate» the border, one of the females swam in his direction with her mouth wide open. It was a formidable spectacle and left not the least doubt as to her intentions. The only thing the man could do to protect himself was to push the animal's mouth away with his hand (you can't very well run away in water). In answer to this the dolphin coiled itself up and struck out strongly with its tail. All this happened in split seconds. The conflicts ended after the dolphins got used to us.

UPBRINGING OF THE YOUNG. The dolphin cubs are born with the ability to swim, dive and prod with their mouths at their mother's mammary glands, from which a jet of thick milk is injected into their mouths. The first 2-3 months the cub

dolphin swims only by his mother's side, in which, by the way, he's assisted by the laws of hydrodynamics. After that he gathers strength and tries to assert his independence.

When the cub is 4-5 months old, the mother sometimes leaves it, though not for a long time, with other dolphins, usually with «aunties» – adult females who have no offspring. When it is about 6 months old, the cub takes each and every opportunity of getting away from the mother – it becomes irresistibly attracted to everything novel. The mother keeps a vigilant eye on the cub and goes out of her way to «distract» it. Sometimes the cub does manage to escape, but never for-long, and is then severely punished. The most effective punishment is to chase it under the water and not let it surface for a spell of fresh air. Another means is to throw the cub up into the air. In both cases the cubs become «well-behaved» for a time.

At 7-9 months the mother punishes the cub by slap-ring it with her tail, bites or pushes it with her snout. This happens, for example, when the cub snatches a fish from under the nose of the older one. But this form of punishment is rarely effective for the cubs often consider it to be a kind of a game. Imitation is of tremendous importance in the life of dolphins. Should anyone of them invent a new trick, all the others learn it very quickly. Once a dolphin amused itself by squirting water at a wall. The next day we could have very well organized a competition among all the dolphins, which of them could squirt the farthest and most accurately. Another dolphin liked a ring very much. It learned to swim with the ring on any of its fins, to push it with its nose, to submerge it, and toss and catch it, to put it on the nose and do the hula-hoop, and throw the ring from its nose sideways. When the other dolphins saw all that they learned the entire bag of tricks immediately. One could quote a large number of similar examples.

Imitation is important in teaching the cubs. Practically, in his mother's school the dolphin goes through a sort of a «university» and when it leaves the school at 4-5 years of age, the male is prepared for independent life and the female to rear her own cub.

DAILY ROUTINE. The dolphins are no meditators. They are always active. Only new and unknown things which may be dangerous can stop activities for a spell.

The main activities are swift-moving games. Usually several dolphins take part. The duration and variety of such games speaks of the high level of emotional activity of the dolphins.

The bottlenose dolphin emits specific sounds under well-defined conditions. A special pair of whistles and the behavior associated with these whistles was first observed in 1955.

The call itself is similar to other whistles in the «vocal exchange» group of sounds. It is repeated many times until an appropriate response is elicited either from the other dolphins in the neighbourhood or from a human. The call consists of a group of two whistles. The first whistle starts at a relatively low fundamental frequency and rises to a relatively high fundamental frequency. The second whistle of the pair starts at a relatively high fundamental frequency and falls to a relatively low fundamental frequency. This pair is emitted repeatedly with a delay of only a few tenths of a second between pair for several seconds or several hours and stops when appropriate relief is obtained.

The call is emitted underwater or in air depending on the circumstance. The intensity of the underwater call can be as low as the noise level of the electronic appa-

ratus or up to 100 decibels higher. In the usual cases during underwater emissions the blowhole slit can either emit air or not emit air. Young, small dolphins usually emit air; older ones may or may not.

In air the call was heard faintly accompanied by bubbles, at the outer lips of the blowhole or heard loudly at the open blowhole from structure deeper in the airways.

There are individual differences in the voices of the animals; trained human listeners can distinguish emissions from individual dolphins. Such differences did not affect the rescue responses of animals meeting for the first time.

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In conclusion I must say that dolphins are very contradictory. They are easily scared – anything new evokes a defense reaction, and they are also very brave – they are not afraid of sharks, allow man to catch and pat them or to transport them, in ships or planes. They dislike everything new, but are nevertheless very inquisitive. They are particularly interested in man and quickly learn how to put their heads out of water to look at him. They are very lively and yet can stay still for hours. It will take much effort on the part of the research workers to amass, bit by bit, their knowledge of the world of the dolphins, which should in the long run provide the answer to the questions posed above. But today we can say with every conviction that man will be able to make the dolphin his assistant in the ocean.

I. Make up a plan of the text using questions.

II. Give a short summary of the text using active vocabulary.

III. What books about dolphins have you read? Write a short report about them.

IV. Discuss the following questions with your fellow students:

1. Are there any leaders in the family of dolphins? Is there mutual help among adult dolphins?
2. Do fights occur among dolphins?
3. How do dolphins multiply? How long do they live?
4. How do dolphins sleep?
5. What contributes to the rapid movement of dolphins in water?
6. How good is dolphins' hearing?
7. How good is dolphins' eye-sight?
8. Can dolphins think?
9. How do dolphins communicate?

## Text 4. GENETICS AND THE ESSENCE OF LIFE

ELEMENTARY UNITS OF HEREDITY. Genetics today is a most brilliant participant in the general revolution wrought in the natural sciences. Its discoveries have led to the emergence of a new concept on the essence of life, and new methods have been evolved for the study and control of heredity, which have greatly affected agricultural production and medicine.

The basic event has been the discovery of the molecular foundations of heredity. It turned out that the rather simple molecules of deoxyribonucleic acid (DNA) carry within them a record of genetic information. This discovery gave rise to a common platform of geneticists, physicists and chemists in analyzing the problems of heredity.

It was found that the genetic information operates within the celt on the principle of guided systems. This allowed in many instances to employ the logic and language of cybernetics in heredity studies.

This discovery upsets the old concept on the omniscient role of protein and showed that the molecules of nucleic acids were responsible for passing on the hereditary features. Under their influence specific proteins are formed in each cell. The controlling mechanism of the cell is concentrated in its nucleus or, to be more precise, in the chromosomes, which are composed of linear sets of genes. Each gene, which in an elementary unit of heredity, is at the same time a complex microcosm, with a chemical pattern of a separate fragment of the DNA molecule.

Thus molecular genetics opened up to man the innermost depths of the organization and functions of life. Like all great discoveries, the development of the chromosome theory of heredity, the theory of genes and the theory of mutations (the teaching on forms of change of the genes and chromosomes) have greatly affected life.

NATURE MADE TO ORDER. Using these new discoveries, people have evolved new methods of selection of plants, animals and micro-organisms. We can say in all confidence that the nature of the productive forces depends largely on the successes achieved in the microbiological synthesis of proteins, antibiotics, amino-acids, vitamins and other Substances. Already today the microbiological industry is based on the use of the so-called radiation and chemical mutants, i.e., the strains of micro-organisms capable of «super synthesis» of the substances we need.

It was found that the energy of radiation or chemical compounds, penetrating into the cell, reaches the genes and causes in them various chemical transformations. As a result, a change takes place in the chemical operation of the cell and geneticists find the strains capable of «super synthesis». In the same way researchers find the changes, which help resist disease, bring about increased photosynthesis sturdiness and other needed features in plants. This has formed the basis for new methods of transforming the nature of plants and some animals.

The problems of radiation and chemical influences are of no little importance for the biology of man himself. Today when the impact of these factors is not yet a menacing danger, we must carefully weigh up the consequences which may arise if the radiation or chemical background on earth is noticeably increased. In consequence of the constant process of natural mutations 4 per cent of all babies are born with marked physical or mental deformities. If the background is intensified this level of aggravated heredity will also grow. Soviet scientists have done a lot of research into this problem and are active in the work of the UN Scientific Committee on the Effects of Atomic Radiation which assesses the effect radiation has on human heredity and keeps a record of radiation on earth.

A number of major achievements in experimental genetics serve to solve in our time the problem of sharply increasing the output of grain crops and of radically changing all agricultural production in the world. By the end of this century the world population will double. In order to adequately supply its requirements we need to double in the next 30 years production of grain and increase the livestock population 10-fold. That means that we must intensify agricultural production.

Experimental genetics has evolved a number of new methods above all, of controlling heterosis (the increased vigour and growth capacity exhibited by hybrids

from specially selected parents) and experimental polyploidy (controlled increase of chromosomes in a cell) and has discovered excellent means of raising crop yields and productivity of animals.

Hybrid maize, hybrid forms of vegetables and polyploid sugar-beet have already won a place in the world and raised yields by 20-30 per cent. At present revolutionary changes are anticipated in selection of wheat – the staple food crop. Everywhere in the world and in our country, too, intense, research is underway to evolve a new high-yield, essentially new kind of hybrid wheat. The application of heterosis hybrids has brought about a sharp increase in the productivity of hens, cattle and other stock.

HEALTH OF MAN. Man himself is becoming the object of close study by geneticists. At every stage of its history genetics was concerned with one major object in its research. At first the genes theory was worked out in experiments with peas, then the pomace fly was used to establish the chromosome theory. Now that molecular genetics is developing by leaps and bounds, the genetics of bacteria and substances is the main problem. But in its future stage genetics research will apparently concentrate on man himself.

A new science – cytogenetics of man – which has developed in the last 6-7 years has established that disruption of the patterns of chromosomes in the nucleus of man's cells may have a grave and, at times, fatal effect on the development of his personality. It was also discovered that the mutations of genes also have effect. Coupled with medicine, genetics can become a shield against the tragic, hereditary maladies which destroy the human personality and cause terrible grief to families where deformed children are born.

I. Give a short summary of the text using active vocabulary.

## Text 5. BIONICS IS THE SCIENCE OF THE FUTURE

The collaboration of biologists and engineers has given rise to an independent branch of scientific and technical research, known as bionics.

Bionics is the crossroads where biology, mathematics, physics, chemistry and technology meet for a common purpose. The collaboration of these sciences helps us to discover increasing numbers of living creatures which are of such a nature that the organizational principles of their organism can undoubtedly be used in the near future to bring great benefit to mankind.

Suffice it to say that living organisms possess a «technology» which far surpasses anything created – by man. It is known, for instance, that the electric ray fish is capable of giving its prey an electric shock of several hundred volts; What better model for engineers who are trying to develop miniature electric accumulators. A study of optical organ of the horse-shoe crab has revealed that the eyes of this creature are able to increase many times over the contrast between the contour of the observed object and its background. This ability adds enormously to the power of vision. If a similar mechanism could be developed by man, our television technology could be improved immeasurably.

Or take the whale, the biggest animal in the world, which can submerge to a depth of 2 kilometres and remain there for about two hours. If man wants to go even a few hundred metres under the water, he has to use special gear, bulky and complicated.

It follows that a study of the mechanisms which allow the whale to withstand this tremendous pressure and to go without breathing for so along would help scientists to develop reasonably simple diving apparatus enabling man to go deep under water for long periods.

Studying whales has proved useful to engineers in a rather unexpected way: ship-building experts have shown that it would be much more economical to give large ocean-going liners and freighters the blunt shape of a whale's head.

Bionics also includes the study of insects – There are approximately one million species of insects, and practically each one possesses wonderful mechanisms which are worth copying. These include organs that are super-sensitive to infrared and ultraviolet rays, organs which record ultra-sonic oscillations, and minute variations of pressure, and many others.

Many animals, birds and fishes migrate annually, and in the course of these migrations they travel thousands of kilometres. The most experienced pilots and sea captains might envy the accuracy of their movement and their ability to orientate themselves without landmarks.

Scientists from different countries are carrying out intricate and ingenious experiments in an attempt to discover what gives the birds and the fishes their advantage over modern navigational systems. A variety of hypotheses have been put forward to explain this marvelous sense of direction that animals possess. It is clear that in time this research will enable us to develop economical and completely accurate systems of navigating boats, planes and spaceships.

Bionics became a separate trend of research in 1961. The very first and most popular definition of bionics characterizes it as a trend studying the living matter with the aim of solving engineering problems. However, the philosophical analysis based on the classical statements made by F. Engels about the forms of motion of matter makes it possible to considerably widen the horizons of this science.

As is known, F. Engels regarded the development of nature as the change from the lower forms of motion to the higher ones. According to his classification the mechanical form was the simplest one. It was followed by the physical, chemical and the most complex in nature - biological form of motion of matter.

However the appearance of man and society resulted 4n the development of «artificial nature», «neosphere», «the second nature», «sociosphere». It also requires classification. One of the ways to do it is to classify it in accordance with the nature classification based on the forms of motion.

In the second nature there must appear systems reproducing the properties of the biological form of motion. Hence, there must be sciences to realize this complex form of motion by technological means. Bionics is one of them. Unlike other sciences of this kind it tries to imitate certain properties of the biological form of motion on the living matter rather than on the dead one, that is on the simpler forms by means of physics and chemistry. All this shows that bionics is a separate field of knowledge. Reproduction of the biological form of motion of matter in artificial systems may be called the most complicated stage of technical development at present.

The important role played by bionics together with other sciences in the scientific and technological progress makes it one of the most promising sciences of our epoch.

By its place in the system of modern knowledge bionics can be defined as a science about the ways and means of, the reproduction (realization) of the biological form Of motion (its principles, properties, laws) in the artificial systems of non-biological nature referring to simple (mechanical, physical and chemical) forms of motion of matter.

The principal tasks of bionics are modeling and reproducing initial laws governing life in its very beginning.

In spite of its being-very young bionics has a number of specific methods of scientific research and applied solutions. First of all mention should be made of the three stage technology of bionic investigations.

The first or biological stage includes the study of certain aspects of living objects. Unlike biology bionics aims at obtaining data for formalization or making a Brodel.

The second stage which is theoretico-mathematical deals with the summary of the data obtained at the biological stage, their formalization, modeling, making functioning schemes and establishing definite laws.

The third technical stage consists in the engineering application of the working model.

One more popular method in bionics is the method of imitation. Its essence is in imitating different properties, structures and laws of living organisms. It is the basis of the initial bionics idea about the solution of engineering problems by means of biology.

Bionics investigations are being carried out on a large scale and embrace a great variety of structures and functions of the living matter. They may be subdivided into a number of groups: general problems, receptors and analysers and their models, neuron and neuronic networks, memory and thinking, orientation, navigation, location and connection in the living world and their technical analogues, recognition of images, bionic aspects of biomechanics, bio-aero-hydrodynamics, biotechnical and man-machine systems.

So bionics is a fundamental science of our time. It discovers and mobilizes a reserve hidden before – the peculiarities of the biological form of motion in the system of non-biological nature.

I. Give a short summary of the text by using active vocabulary.
II. What branches of science is bionics connected with? Give its definition.

## Text 6. LOUIS PASTEUR

Famous scientist, Louis Pasteur, succeeded in finding out the cause and cure of the disease named hydrophobia – that doomed men to torments and hopeless suffering. Pasteur may be called a life-saver. He treated bitten people with injections of weakened rabies virus. Introduced by Pasteur this treatment is used everywhere now

and has already saved thousands of human lives. Here is the episode how he cured the boy bitten by a mad dog.

***

On Monday, July 6, Pasteur saw a little Alsatian boy, Joseph Meister, enter his laboratory, accompanied by his mother., He was only nine years old, and had been bitten two days before by a mad dog at Meissengott, near Schlestadt.

The child, going alone to school by a little by-road, had been attacked by a furious dog and thrown to the ground. Too small to defend himself, he had only thought of covering his face with his hands. A bricklayer, seeing the scene from a distance, arrived, and succeeded in beating the dog off with an iron bar; he picked up the boy, covered, with blood and saliva. The dog went back to his master, Theodore at Meissengoot, whom he bit on the arm: Vone seized a gun and shot the animal, whose stomach was found to be full of hay, straw, pieces of wood, etc. When little Meister's parents heard all these details they went, full of anxiety, to consult Dr. Weber, at Ville, that same evening. After cauterizing the wounds with carbolic, Dr. Weber advised Mme. Meister to start for Paris, where she could relate the facts to one who was not a physician, but who would be the best judge of what could be done in such a serious case. Theodore Vone, anxious on his own and on the child's account, decided to come also. Pasteur reassured him; his clothes had wiped off the dog's saliva and his shirt sleeve was intact. He might safely go back to Alsace and he promptly did so.

Pasteur's emotion was great at the sight of the fourteen wounds of the little boy, who suffered so much that he could hardly walk. What should he do for this child? Could he risk the preventive treatment which had been constantly successful on his dogs? Pasteur was divided between his hopes and his scruples, painful in their acuteness. Before deciding on a course of action, he made arrangements for the comfort of this poor woman and her child alone in Paris, and gave them an appointment for five o'clock, after the Institute meeting. He did not wish to attempt anything without having seen Vulpine (a member of the official Commission that had been appointed to investigate his work). Since the Rabies Commission had been constituted, Pasteur had formed a growing esteem for the great judgment of Vulpine.

Vulpine expressed the opinion that Pasteur's experiments on dogs were sufficiently conclusive to authorize him to foresee the same success in human pathology. Why not try this treatment added the professor usually, so reserved. Was there any other efficacious treatment against hydrophobia? If at least the cauterizations had been made with a red-hot iron? But what was the good of carbolic acid twelve hours after the accident? If the almost certain danger which threatened the boy were weighed against the chances of snatching him from death, Pasteur would see that it was more than a right, that it was a duty to apply antirabic inoculation to little Meister.

This was also the opinion of Dr. Grancher, whom Pasteur consulted. M. Grancher worked at the laboratory; he and Dr. Straus might claim to be the first two French physicians who took up the study of bacteriology.

Vulpine and M. Grancher examined little Meister in the evening, and, seeing the number of bites, some of which, on one hand especially, were very deep, they decided on performing the first inoculation immediately; the substance chosen was fourteen days old and had quite lost its virulence: it was to be followed by further inoculations gradually increasing in strength.

It was a very slight operation, a mere injection into the side of a few drops of a liquid prepared with some, fragments of medulla oblongata. The child, who cried very much before the operation, soon dried his tears when he found the slight prick was that entire he had to undergo.

Pasteur had had a bedroom comfortably arranged for the mother and child in the old Rollin College, and the little boy was very happy amid the various animals – chickens, rabbits, white mice, guinea pigs, etc.; he begged and easily obtained of Pasteur the life of several of the youngest of them.

«All is going well», Pasteur wrote to his son-in-law on July 11: «the child sleeps well» has a good appetite, and the inoculated matter is absorbed into the system from one day to another without leaving a trace. It is true that I have not yet come to the last inoculations, which will take place on Tuesday, and Thursday. If the lad keeps well during the three following weeks, I think the experiment will be safe to succeed. I shall send the child and his mother back in any case on August 1, giving these good people detailed instruction as to the observations they are to record for me. I shall make no statement before the end of the vacation». But, as the inoculations were becoming more virulent, Pasteur became a prey to anxiety. «My dear children», wrote Mme. Pasteur, «your father has had another bad night; he is dreading the last inoculations on the child. And yet there can be no drawing back now! The boy continues in perfect health».

Renewed hopes were expressed in the following letter from Pasteur.

«My dear Rene, I think great things are coming to pass. Joseph Meister has just left the laboratory. The three last inoculations have left some pink marks under the skin, gradually widening and not at all tender. There is some action, which is becoming more intense as we approach the final inoculation, which will take place on Thursday, July 16. The lad is very well this morning and has slept well, though slightly restless; he has a good appetite and no feverishness. He had a slight hysterical attack yesterday».

The letter ended with an affectionate invitation, «Perhaps one of the great medical facts of the century is going to take place; you would regret not having seen it!»

Pasteur was going through a succession of hopes, fears, anguish, and an ardent yearning to snatch little Meister from death; he could no longer work. At nights, feverish visions came to him of his child whom he had seen playing in the garden, suffocating in the mad struggles of hydrophobia, like the dying child he had seen at -the Hospital Trousseau in 1880. Vainly his experimental genius assured him that the virus of that most terrible of diseases was about to be vanquished, that humanity was about to be delivered from, this dread horror – his human tenderness was stronger than all, his accustomed ready sympathy for the sufferings and anxieties of others was nonce centered in «the dear Tad».

The treatment lasted ten days; Meister was inoculated twelve times.

Cured from his wounds, delighted with all he saw, gaily running about as if he had been in his own Alsatian farm, little Meister, whose blue eyes now showed neither fear-nor shyness, merrily, received the last inoculation; in the evening after claiming kiss from «Dear Monsieur Pasteur», as he called him, he went to bed and slept peacefully. Pasteur spent a terrible night of insomnia; in those slow, dark hours of night, when

all vision is distorted, Pasteur, losing sight of the accumulation of experiments which guaranteed his success, imagined that the little boy would die.

The treatment being now completed, Pasteur left little Meister to the care of Dr. Grancher (the lad was not to return to Alsace until July 27) and consented to take a few days' rest. He spent them with his daughter in a quiet, almost deserted country place in Burgundy, but without, however, finding much restfulness in the beautiful peaceful scenery; he lived in constant expectation of Dr. Graneher's daily telegram or letter containing news of Joseph Meister.

By the time he went to the Hura, Pasteur's fears had almost disappeared. He wrote from Arbois to his son August 3, 1885: «Very good news last night of the bitten lad. I am looking forward with great hopes to the time when I can draw a conclusion. It will be, thirty-one days tomorrow since he was bitten».

## Text 7. I. P. PAVLOV

Ivan Petrovich Pavlov was born in the old Russian city of Ryazan on September 14, 1849. His father was then a young priest of a poor parish and had to supplement his income by work in the garden and orchard. He was something of an intellectual who loved books and read widely. From him Ivan acquired a love of learning and a respect for scholarship.

Ivan Petrovich started lessons in reading and writing at the age of five from an elderly lady who drilled him with unflagging zeal. But his greatest joy was in working, with his father in the garden and orchard, a taste for physical work which he carried through life.

Due to a fall which seriously affected his general health, he did not enter the Ryazan church school until he was eleven. When he finished the elementary course, he entered the local theological seminary.

During Pavlov's student years Russia was going through momentous changes, the middle of the nineteenth century was a turbulent time. The serfs won their freedom in 1861 and the ferment around this issue dominated the intellectual life of the country. It was the period of the revolutionary democrats and enlighteners – Belinsky, Herzen, Chernyshevsky, Dobrolyubov, Pisarev. These men fought against reaction in political life, in culture and in science; Liberalism was the temper of their thought and materialism was their philosophy. This group of revolutionary thinkers had a strong influence on the young Pavlov. Following their articles in the progressive journals and their fiery debates on science, he was imbued with their enthusiasm and their ideas.

In a short autobiographical piece, Pavlov later wrote of this period: «Under the influence of the literature of the sixties, especially Pisarev, our intellectual interests turned to natural science in the University». While still at the seminary hi was strongly moved by two books that were to be permanent influences in his life. The first was «Reflexes of the Brain», the classic work of the founder of physiology in Russia, I. M. Sechenov, and the second was a text-book, on practical physiology.

Under these influences Pavlov rejected his hereditary career in the church and left the seminary without completing the course. He then entered the University at

St. Petersburg, where he enrolled in the physics and mathematics department, taking the natural science course. His excellent record and a certificate of poverty brought him a scholarship which covered his living expenses.

At the University Pavlov studied with a number of outstanding teachers. He sat under such professors as Mendeleyev in inorganic chemistry and Butlerov in organic chemistry. But it was I. F. Tsyon's course in physiology which settled the question of career for him. Tsyon was an extraordinarily skilled experimenter and his tutelage played a big part in making the young Pavlov into one of the greatest experimental scientists of all time. Pavlov's schoolboy interest in physiology developed rapidly into a firm resolve to master the subject. In the autobiography he wrote: «At the time the faculty was in a brilliant state. We had a number of professors of great authority in science with outstanding talents as lecturers. I chose for my major course animal physiology, and took chemistry as a minor. We physiologists were enormously impressed by Tsyon. We were truly fascinated by his ingeniously simple exposition of the most complex physiological questions, and his masterful ability in conducting experiments. One сал never forget such a teacher.»

While still an undergraduate at the University, Pavlov, under Tsyon's direction and together with another student, conducted his first experimental research. It was concerned with the physiology of the nerves of the pancreas. He received a gold medal for his work. In 1875 he completed his course with an outstanding record and received the degree of Candidate of Natural Sciences.

The following four years were difficult ones for the, young scientist. It was hard to find work since the universities were controlled, as a rule, by political appointees' of the tsarist regime. Those interested in serving science rather than currying favor was forced to leave the country to carry on their researches. Among such victims were Sechenov and Mechnikov, Pavlov was no exception. So for four years he moved from laboratory to laboratory.

But finally in 1870, after graduating at the Military Medical Academy with a gold medal award for his research, he won a two year fellowship. About the same time he was invited by the famous clinician, S. P. Botkin, to work in the physiological laboratory at his clinic. Here Pavlov could devote all his time to research, which he did until 1890. He was, in fact if not in title, in charge of the laboratory, if a small bathhouse with no equipment and no funds to buy animals for experiments can be dignified with the title. But here in his first laboratory Pavlov was completely his own master and thus had full opportunity for creative development.

It was mainly in the Botkin clinic that Pavlov carried on his research into the nervous regulation of blood circulation. Here we are not primarily concerned with the results of these experiments, but we are interested in the new experimental method devised by Pavlov, for it was one component leading to the eventual discovery of conditioned reflexes.

Pavlov found that the classic physiological method of experimenting on anaesthetized animals was unsuitable for work on the complex problem of nerve regulation. Anaesthesia had a distorting effect on the reflex actions of the nervous system. Pavlov succeeded in eliminating this and in taking a first step toward his method of studying the functions of the intact organism under natural conditions. He did this by

training the experimental dogs to lie on the operating table and calmly undergo without narcosis all the manipulations of an elaborate arid lengthy experiment: incising the skin and surface tissues; disclosing the artery and connecting it to instruments for registering blood pressure and similar procedures.

By this new method Pavlov was able' to discover a number of important laws concerning the reflex regulation of the cardiac and vascular functions. From these discoveries he made a broad generalization to the effect that not only the blood vessels, but all organs contain specific sensitive nerve devices adapted to respond to mechanical, physical stimulants. From this he concluded that it is the nervous system that regulates and combines the varied activity of the organism into one unified whole.

These broad generalizations were by no means speculative, but were the result of almost fifteen years of exacting yet creative experimental work. They were firmly rooted in what Pavlov throughout his life liked to refer to as «Mr. Fact». In 1890 Pavlov was appointed Professor of Pharmacology at the Military Medical Academy; He remained for five years at this post, and then was appointed to the chair of physiology in the same academy, which he held for some thirty years. It was at the Military Medical Academy that he did some of his work on the digestive system and the early phase of the work on conditioned reflexes.

Meantime he had been invited in 1891, to organize and direct the department of physiology in the new Institute of Experimental Medicine, He was head of that department for 45 years – until the end of his life. Here he did the bulk of his classic experiments on digestive glands which made him world famous.

The study of digestion was one of the background branches of physiology. The chief reason was that the old «acute» or vivisectional type of experiment was not suitable for studying the intricate workings of the digestive glands. In overcoming this difficulty Pavlov perfected his method of the chronic experiment, begun in his work on circulation.

The method was called «chronic», meaning lasting a long time or continuously, in opposition to the «acute», meaning short but critical, or coming speedily to a crisis through drastic surgery (for example, the removal of organs for purposes of analysis). This latter method had played an important role in physiological research as long as the analysis of structure was the primary task. But when the function of an organ or system of organs was to be investigated, the drastic acute method was far too crude and led, to distortions of functions which made discovery of laws all but impossible.

The secret of the chronic method as employed by Pavlov was to treat the organism as a whole thus making possible the investigation of the interrelation of organs. The technique employed was the construction, through highly skilled surgery, of a fistula, an opening or a «window». This fistula would then allow the experimenter to observe the functioning of the gland or organ or system under controlled conditions but without interference with the normal, healthy functioning of the animal.

Pavlov devised and performed a series of ingenious and delicate operations to construct these fistula «windows». He built fistulas in the stomachs, pancreas and salivary glands of his experimental animals. These made accessible for observation and experiment the internal digestive organs without impairing their nervous regulation, blood supply, and interconnection throughout the animal organism. They made it possi-

ble for the researcher to observe and experiment on an animal while at the same time it lived a normal life and its living conditions remained essentially unaltered.

Pavlov accomplished this feat by masterful surgical technique and by instituting for the first time in history the kind of aseptic operative and post-operative care which had up to that time been the case only in hospitals for human beings. This was absolutely necessary if the experiment was to be chronic. The health of the animal had above all to be preserved or restored.

On such healthy animals with fistula «windows» in different parts of the digestive system, Pavlov carried forward his experiments to discover the facts and laws of digestion. This synthetic approach, the chronic method, made possible, a much closer, and more detailed and all-sided study of the digestive glands as they function under normal life conditions without disturbing the integrity of the complex organism or its relation with the environment.

Here again we are not primarily concerned with the results of these experiments on the digestive glands. We are, however, deeply concerned with the innovation in method. For it was this method that was to make possible Pavlov's work with the conditioned reflex.

The acute type of experiment is mechanical in approach since it treats .the organs and systems of the organism as parts of a simple machine which can be disassembled without changing their nature and function. At the same time, it isolates the organism from its environment. The acute experiment as Pavlov put it, is unfit even «to obtain irreproachable analytical data,» let alone synthetic methods, analysis and synthesis, both are essential for scientific experiment if it is to disclose the function as well as the structure of complex living matter. This is particularly true when the investigation concerns nervous regulation, since all nerves are coordinated through the central nervous system, and isolation cannot but disrupt and distort the complex interrelations.

Analysis means the separation of anything into its constituent parts. It is the resolving, dissecting, reducing of a thing from a single whole to its discrete elements. Such a process is an indispensable phase of any scientific inquiry. But it must be viewed as a phase, and not as an end in itself. For an organ is not simply a collection of parts, but is a system, a more or less complex interrelation of constituent elements. Not only that, but the organ is likewise, itself, not isolated from others which together form another system. Thus any system of parts forming a single organic whole is interrelated in two ways, internally and externally; that is, the interconnection of internal parts and the interrelation of organism and environment.

The process of studying the interconnections and interrelations and of .treating the organism as a whole, together with its life conditions, is called synthesis, or the synthetical method. Synthesis is the putting together the composition, the combination of parts or elements to form a whole. As such, it is the direct opposite of analysis. The two in their interconnection form the methodology of science, if it is to discover the laws of complex processes.

Pavlov was the first physiologist to employ both approaches systematically. The chronic experiment was the solution of the problem of synthesis in physiological investigation. He supplemented the analytical approach to the structure and functions

of the organism with a synthetic one. In this way he created a dialectical method of study; that is, he combined the two opposite methods into one unified approach. It was' this dialectical method which enabled Pavlov to study the organism in its integrity and in its unity with its environment.

In his study of blood circulation and of digestion, Pavlov «was governed by a single idea: to investigate the nervous regulation of the activity of the organism. This idea or principle he called «nervism». «By nervism», Pavlov wrote, «I mean the tendency in physiology which tries to extend the influence of the nervous system on the greatest possible number of functions of the organism».

This principle was not entirely new with Pavlov, but had a brief history prior to his work. I. M. Sechenov, I. F. Tsyon, and S. P. Botkin played significant roles in developing it. It was Pavlov, however, who embodied nervism wholly in his work and who, with his later study of brain physiology, brought it to full fruition.

Under the theoretical guidance of the principle of nervism and employing the method of the chronic experiment with its fistula window, Pavlov in his twenty-old years of work on digestion proved conclusively that the main digestive glands, such as the liver, the gastric glands, and the pancreas, have nerves that cause the secretion of digestive juices. This was a major discovery, one which brought the study of digestion out of the stagnation in which it had remained for decades.

Pavlov published in 1897 the results and generations of his study of digestion in a book entitled «Work of the Digestive Glands». For this he was awarded the Nobel Prize in 1904. He was the first Russian scientist, and the first physiologist in the world, to receive the award.

I. Make up key questions to the text.

II. Give the contents of the text in detail using your key questions.

III. Write a brief summary of the text in English.

IV. Discuss the following questions with your fellow students:

1) In what way does conditional behaviour differ from a reflex response? Write a report about it.

2) Describe Pavlov's experiment. What happens in the dog's brain as a result of conditioning?

3) What is a conditional behaviour? Give your example.

## Unit 4
## TEXTS FOR ADVANCED STUDENTS

### Text 1. Green Packaging

**Pre-Reading Questions:**

1. If a friend asked, «What has the environment to do with us?» what would your answer be?
2. What can you do to be environmentally-friendly?
3. Why is it sometimes difficult to be environmentally-friendly?

**Reading Passage**

*Now read the passage below. You can look up the meanings of the words and phrases in bold in the Vocabulary Study section that follows.*

Manufacturers are currently competing with each other to produce a form of **green** packaging. **Packaging** is an important part of marketing these days, but much of it is a threat to the **environment.** There are two reasons for this. The production of such packaging uses up a great deal of **energy** and the **cartons,** wrappers, etc are often difficult to **dispose of** when they become **waste** material.

People in most countries have become aware of the damage which modern living is doing to the environment, and many of them are concerning themselves with the **conservation** of the environment for future generations. Thus, both politicians and scientists are now looking at the issues of energy-saving and **waste disposal** with a view to making them more **environmentally-friendly.**

As far as packaging is concerned, it is vital that it is either **recyclable** or **biodegradable.** For example, instead of throwing out newspapers and glass bottles with their household rubbish, people in several countries are being encouraged to put these in special containers to allow the material to be **recycled.** Some household waste, such as vegetable **peelings,** is naturally biodegradable and so **decomposes** gradually until it disappears.

Man-made goods are not so easily disposed of. Goods and packaging made of plastic create waste material that is particularly difficult to get rid of. This means that huge **landfill sites** have to be dug out so as to bury the plastic waste underground, possibly causing problems for future generations.

Just as much of a problem is industrial waste, since the **effluent** from factories often contains chemicals which can lead to the **pollution** of water supplies. Waste from factories has to be **monitored** carefully in order to avoid this.

Technological advances using nuclear power have added to the waste problem. The disposal of **nuclear waste** causes particular concern because it is radioactive and so possibly dangerous to life.

The high standard of living, which the people of many countries now enjoy, has resulted in a huge increase in waste material. This could have a terrible effect on the **ecology** of the planet. There is no doubt that urgent action must be taken to save our environment from possible **disaster.**

**Vocabulary Study**

✓ **biodegradable** *adjective* made of material which will naturally decay relatively quickly because of the action of bacteria on it.

✓ **carton** *noun* a container made from lightweight cardboard or plastic in which certain food or drink is sold.

✓ **conservation** *noun* the act of protecting and preserving something, especially the environment. **conserve** *verb*.

✓ **decompose** *verb* to be broken down by the action of bacteria; to rot or decay.

✓ **disaster** *noun* an unexpected event that causes a lot of damage. destruction, injury or death. **disastrous** *adjective* connected with or involving a disaster.

✓ **dispose of** *verb* to get rid of something that you do not want, disposal *noun* the act or process of disposing of something.

✓ **ecology** *noun* the relationship between human, animal and plant life and its environment or the study of this, **ecological** *adjective* relating to ecology or to the environment or relating to things that are of benefit to or protective of the environment.

✓ **effluent** *noun* waste material in the form of liquid discharged from a sewage works, factory, etc.

✓ **energy** *noun* 1) a supply or source of power, such as electrical power, solar power, etc. 2) ability and power to be active so that you are able to work, get things done, etc. 3) liveliness and enthusiasm.

✓ **environment** *noun* the external surroundings in which people, animals and plants live **environmental** *adjective.*

✓ **environmentally-friendly** *adjective* not causing any damage to the environment.

✓ **green** *adjective* concerned with the protection and conservation of the environment, **the Greens** or **Green Party** is the name given to a political party which encourages the protection of the environment.

✓ **landfill site** *noun* a place where waste material is buried under layers of earth, often being excavated especially for this purpose.

✓ **monitor** *verb* to check something at regular intervals in order to find out any changes or developments, **monitoring** *noun* the act of monitoring something.

✓ **nuclear waste** *noun* the radioactive waste which is left after an industrial nuclear process has been completed.

✓ **packaging** *noun* the materials in which objects are wrapped before they go on sale.

✓ **peelings** *noun plural* pieces of fruit or vegetable skin that are cut off as being unwanted, **peel** *verb* to remove the skin from a piece of fruit or vegetable.

✓ **pollute** *see* pollution.

✓ **pollution** *noun* the act or process of causing something, such as the environment, air or water, to become dirty, harmful or unfit for use **pollute** *verb* to cause something to be dirty, harmful or unfit for use. **pollutant** *noun* something which pollutes.

✓ **recyclable** *see* recycle.

✓ **recycle** *verb* to put material or an object through some kind of process that allows it to be used again. **recyclable** *adjective* of material, can be recycled.

✓ **waste** *noun* 1) unwanted material which remains after something has been used. 2) unnecessary, extravagant, wrong or unwise use of something, **waste** *verb* to use something in an unnecessary, extravagant, wrong or unwise way.

✓ **waste disposal** *noun* the act or process of getting rid of waste.

## Vocabulary Building

Task 1. Match each word in Column A with its meaning in Column B. Write the corresponding letter in the box next to the word.

| **Column A** | | **Column B** |
|---|---|---|
| 1. currently | | a. supply of power |
| 2. environment | | b. products |
| 3. energy | | c. used again |
| 4. dispose of | | d. surroundings |
| 5. recycled | | e. is not there anymore |
| 6. disappears | | f. harmful |
| 7. goods | | g. now |
| 8. dangerous | | h. remove |

Task 2. Match each word in Column A with its opposite meaning in Column B. Write the corresponding letter in the box next to the word.

| **Column A** | | **Column B** |
|---|---|---|
| 1. difficult | | solutions |
| 2. future | | easy |
| 3. throwing | | discouraged |
| 4. encouraged | | taken away from |
| 5. problems | | suffer from |
| 6. often | | past |
| 7. added to | | collecting |
| 8. enjoy | | seldom |

Task 3. Choose the most appropriate word, provided in italics, to complete each of the sentences.

*waste material* *packaging* *pollution* *disaster*

1. Most modern cities face heavy _____.
2. The _____caused by the floods led to much suffering.
3. Most things that we buy will have a lot of _____.
4. _____ is difficult and expensive to get rid of.

**Read and Understand**

Task 1. Say whether each of the sentences below is True or False.

| | |
|---|---|
| 1. The environment suffers when there is heavy packaging of the things we buy. | True / False |
| 2. Politicians and scientists are not giving any attention to the problems of the environment. | True / False |
| 3. Newspapers and glass bottles can be recycled. | True / False |
| 4. It is difficult to get rid of plastic goods. | True / False |
| 5. Rich countries take care to cut down on waste. | |

Task 2. Answer these questions in full sentences.

1. What are the two reasons that packaging is harmful to the environment?
2. Which groups of people are looking at the issues of the environment?
3. What are the important qualities for packaging to be green?

**Pair Work**

With your partner, first discuss your answers to the questions below. Then write out each of your answers in one or two sentences.

1. Would you support the use of less packaging? Give reasons for your answer.
2. What recycling efforts arc carried out in your school?
3. What recycling efforts are carried out in your neighbourhood?
4. What can you do to be more environmentally-friendly?

**Spot the Error**

Task 1. In each sentence below, you will find an error with the subject-verb agreement (concord). Underline the error and rewrite the sentence by using the correct concord.

*Sentence with error:* In a modern society, people enjoys a high standard of living.

*Corrected sentence:* In a modern society, people *enjoy* a high standard of living.

1. Too much packaging harm the environment in two ways.
2. Future generations will suffer unless people today conserves the environment.
3. The writer advises that every household do its part by recycling.
4. Usually people gets rid of waste by dumping it into landfills.
5. Nuclear waste are dangerous because it is radioactive.

Task 2. Complete the sentences below by giving your view.

1. I think green packaging **should** be carried out because_____.

**OR** I think green packaging **should not** be carried out because_____.

2. I want to help the environment because_____.
3. I think people harm the environment by _____.

## Text 2. Too Much Traffic

**Pre-Reading Questions:**

1. Do you think your city has too much traffic? Give your reasons.
2. Do you support actions to control city traffic?
3. Would you own a car if you are of age to drive and can afford to? Why or why not?

**Reading Passage**

Now read the passage below. You can look up the meanings of the words and phrases in bold in the Vocabulary Study section that follows.

Many of the problems which face governments nowadays are international ones. Take traffic, for example. AH the major cities of the world are having to try to find ways of dealing with too many **vehicles** and the **congested** roads which they cause.

A large number of the vehicles which **clog** our cities are **private cars. Motorists** are very reluctant to leave their precious cars behind and go to work on **public transport,** despite the constant **traffic jams.** They regard buses, trams and trains as being for other people, while they themselves like to drive from door to door. Thus, our roads are **chock-a-block** with traffic.

Of course, parking space is not always available. Some firms provide **car parks** or **garages,** where at least some of their employees can leave their cars. Most people, however, have to rely on public car parks, often **multi-storey** ones, or else try to park in the street. Since this is usually highly restricted, with many **parking meters** in evidence, parking is a source of **frustration** to many motorists.

People who are otherwise quite law-abiding are apt to take a bit of a risk when it comes to traffic **offences.** Thus, they ignore both signs that say «NO PARKING» and lines painted down the edge of the road which indicate parking **restrictions.** Should they be away from their cars for longer than the amount of time allowed by the parking meter, they are not worried – until they see that the **traffic warden** has left a **parking ticket** on their **windscreen,** and realize that they will have to pay a fine.

The authorities in more and more cities are trying to keep cars out of the city centre. With this aim, they have **pedestrianized** large areas and introduced **park-and-ride** schemes so that people will leave their cars at the city boundary and complete their journey by bus.

Still, there are fears that ever-increasing traffic will cause **gridlock** in cities, particularly at **rush hours.** With so many **tailbacks** and **bottle-necks** on so many roads, motoring is no longer a pleasure. Why, then, do so many of us persist in using our cars?

**Vocabulary Study**

- ✓ **bottle-neck** *noun* a place where a road grows narrow or a place where there is often a great deal of traffic, causing traffic either lo slow down or stop completely.
- ✓ **car park** *noun* an area of ground or a building where cars can be parked temporarily
- ✓ **chock-a-block** *adjective* extremely full or crowded.
- ✓ **clog** *verb* to cause a road, etc. to become blocked, so slowing down or preventing movement of traffic.

✓ **congested** *adjective* 1) extremely overcrowded, making moving around slow or difficult 2) of a part of the body, blocked with an abnormal amount of blood or other fluid, such as mucus, **congestion** *noun* the state of being congested.

✓ **fine** *noun* a sum of money which has to be paid as a punishment for breaking a law or rule. **fine** *verb* to make someone pay **a** sum of money as a punishment for breaking a law or rule.

✓ **frustration** *noun* the feeling of being annoyed and impatient. **frustrating** *adjective*, **frustrated** *adjective.*

✓ **garage** *noun* a building, often attached to a house, office, etc, where cars may be parked or kept.

✓ **gridlock** *noun* a situation in a city, etc, in which roads become so blocked with cars that it is impossible for traffic to move in any direction and so it comes to a stop.

✓ **motorist** *noun* a person who owns and drives a car. **motoring** *adjective* connected with driving a car.

✓ **multi-storey** *adjective* having several storeys or levels, **multi-storey** *noun* a car park having several storeys or levels.

✓ **offence** *noun* an act which breaks a law or regulation.

✓ **park-and-ride** 1) *adjective* of a transport system, designed to reduce the amount of traffic in towns or cities, in which motorists park their cars at the edge of a town and take a bus from there to the town centre. 2) *noun* such a transport system.

✓ **parking meter** *noun (sometimes shortened to* **meter***)* a machine at a roadside parking space into which you put coins to pay for parking and which shows the length of time that you may legally park.

✓ **parking ticket** *noun (sometimes shortened to* **ticket***)* an official notice which is placed on a vehicle to show that it is illegally parked and to order you to pay money as a fine.

✓ **pedestrianized** *adjective* of a street, etc, in which cars are not allowed so that people can walk safely, **pedestrian** *noun a* person who travels on foot and not in a car, etc.

✓ **pedestrian crossing** *noun a* place on a road where pedestrians may cross.

✓ **private car** *noun* a car which is owned and driven by an individual.

✓ **public transport** *noun* a system of transport for use by members of the public, consisting of a network of vehicles, such as buses, trains or trams, which travel on fixed routes at set times and charge passengers set fares.

✓ **restriction** *noun* a law or rule that limits something in some way.

✓ **restrict** *verb* to limit the amount, size, etc of something.

✓ **rush hour** *noun* the busy part of the day in a town or city when there is a lot of traffic, usually the times when people are either coming in to work or leaving work.

✓ **tailback** *noun* a long line of very slow-moving or stationary traffic caused by something which is blocking the road.

✓ traffic **jam** *noun* a great many vehicles close together which can only move very slowly and which frequently come to a halt.

✓ **traffic warden** *noun* in some countries, a person in uniform employed to stop people from parking in places where they are not allowed to do so, or from parking somewhere for longer than they are allowed, and to give parking tickets to motorists who ignore the regulations.

✓ **vehicle** ***noun*** *(also* **motor vehicle)** [formal] a machine, usually with wheels and an engine, which is used on land for carrying people or goods from one place to another.

✓ **windscreen** *noun* the front window of a motor vehicle.

**Vocabulary Building**

Task 1. Match each word in Column A with its meaning in Column B. Write the corresponding letter in the box next to the word.

| **Column A** | | **Column B** |
|---|---|---|
| 1. congested | | a. valuable |
| 2. motorists | | b. overcrowded |
| 3. precious | | c. depend on |
| 4. possible | | d. the departments in charge |
| 5. rely on | | e. continue |
| 6. law-abiding | | f. can be done |
| 7. authorities | | g. drivers |
| 8. persist | | h. obedient to the law |

Task 2. Match each word in Column A with its opposite meaning in Column B. Write the corresponding letter in the box next to the word.

| **Column A** | | **Column B** |
|---|---|---|
| 1. major | | a. shorter |
| 2. large | | b. not concerned |
| 3. constant | | c. ended |
| 4. restricted | | d. unlimited |
| 5. ignore | | e. small |
| 6. longer | | f. attend to |
| 7. worried | | g. minor |
| 8. introduced | | h. infrequent |

Task 3. Choose the most appropriate word, provided in italics, to complete each of the sentences.

*vehicles traffic motorists fine journey*

1. The heavy _____caused a big jam on the motorway.
2. Those caught speeding will have to pay a _____.
3. To break the long_____, we will stop overnight at a hotel.
4. _____ were advised to avoid Country Street as a tree had fallen across it.
5. Each Sunday, second-hand _____will be sold at the parking lot.

**Read and Understand**

Task 1. Say whether each of the sentences below is True or False.

| | |
|---|---|
| 1. Traffic problems are the worst in western countries. | True / False |
| 2. One reason for traffic jams is that not enough people take public transport. | True / False |
| 3. Quite often there is insufficient parking space in the city. | True / False |
| 4. People will only park in the areas set aside for parking. | True / False |
| 5. The authorities have no ideas about how to cut down traffic in the city centre. | True / False |

Task 2. Complete these sentences, taking information from the passage.

1. Parking space is limited, so some firms_____.
2. Motorists, who park illegally in the city area, face the risk of_____.
3. To cut down the number of cars in the city, the authorities_____.

**Pair Work**

With your partner, first discuss your answers to the questions below. Then write out each of your answers in one or two sentences.

1. Suggest one way to cut down the number of cars entering the city area.
2. What could be a new way to solve the parking problems in the city area?
3. If you have a car, would you drive into the city on a weekday? Give your reasons.

**Spot the Error**

Task 1. In each sentence below, you will find an error with the subject-verb agreement (concord). Underline the error and rewrite the sentence by using the correct concord.

*Sentence with error:* Governments nowadays faced international problems.

*Corrected sentence:* Governments nowadays *face* international problems.

1. Recently some countries solve the problem of heavy traffic in the city centre by charging for entry.
2. I wished to suggest that to reduce traffic into the city area, there should be less parking space there.
3. If the public transport system was improved then more people will use it.
4. From 1995, the authorities increase the price of cars to cut car ownership.
5. Many large cities were still trying to solve their traffic problems.

Task 2. Complete the sentences below by giving your view.

1. I think that heavy traffic in the city centre is a problem because____.

*OR* I do not think that heavy traffic in the city centre is a problem because____.

2. To encourage people to leave their cars at home, _____.
3. If I can afford it, I would buy a car because_____.

*OR* Even if I can afford it, I would not buy a car because_____.

## Text 3. Climate Change

**Pre-Reading Questions:**

1. Are you concerned about the world becoming warmer? Give a reason for your answer.
2. Do you agree with these statements? Why or why not?
- Human activities are causing the world to become warmer.
- Governments are not doing enough about the world becoming warmer.

3. Ask one question that you would like answered after reading the passage.

**Reading Passage**

Now read the passage below. You can look up the meanings of the words and phrases in bold in the Vocabulary Study section that follows.

Experts in **climatology** and other scientists are becoming extremely concerned about the changes to our **climate** which are taking place. Admittedly, climate changes have occurred on our planet before. For example, there have been several **ice ages** or **glacial periods.**

These **climatic** changes, however, were different from the modem ones in that they occurred gradually and, as far as we know, naturally. The changes currently being **monitored** are said to be the result not of natural causes, but of human activity- Furthermore, the rate of change is becoming alarmingly rapid.

The major problem is that the planet appears to be warming up. According to some experts, this warming process, known as **global warming,** is occurring at a rate **unprecedented** in the last 10,000 years. The **implications** for the planet are very serious. Rising **global** temperatures could give rise to such **ecological** disasters as extremely high increases in the incidence of flooding and of **droughts.** These in turn could have a harmful effect on agriculture.

It is thought that this unusual warming of the Earth has been caused by so-called **greenhouse** gases, such as carbon dioxide, being **emitted** into the **atmosphere** by car engines and modern industrial processes, for example. Such gases not only add to the **pollution** of the atmosphere, but also create a **greenhouse effect,** by which the heat of the sun is trapped. This leads to the warming up of the planet.

Politicians are also concerned about climate change and there are now regular **summits** on the subject, attended by representatives from around 180 of the world's **industrialized** countries. Of these summits, the most important took place in Kyoto in Japan in 1997. There it was agreed that the most industrialized countries would try to reduce the volume of greenhouse gas **emissions** and were given **targets** for this reduction of emissions.

It was also suggested that more forests should be planted to create so-called **sinks** to absorb greenhouse gases. At least part of the problem of rapid climate change has been caused by too drastic **deforestation.**

Sadly, the targets are not being met. Even more sadly, global warnings about climate changes are often still being regarded as scaremongering.

**Vocabulary Study**

✓ **atmosphere** *noun* the mixture of gases that surrounds the earth and some other planets. **atmospheric** *adjective* connected with the atmosphere of the earth.

✓ **climate** *noun* the typical pattern of weather conditions in a particular area. **climatic** *adjective (formal* or *technical)* connected with climate. **climatology** *noun* the scientific study of climate or weather conditions.

✓ **deforestation** *noun* the cutting down, or burning, of trees in a large area.

✓ **drought** *noun* a long period of extremely dry weather when not enough rain falls for crops to grow successfully.

✓ **ecological** *see* **ecology.**

✓ **ecology** *noun* the relationship between human, animal and plant life and its environment; the study of this relationship. **ecological** *adjective* relating to ecology or lo the environment or relating lo things that are of benefit to or protective of the environment.

✓ **emission** *see* emit.

✓ **emit** *verb* to give or send out something, such as a noise, smell, light. heat or gas. **emission** *noun* something that is entitled; the act of emitting something.

✓ **glacial period** *noun* a more formal and technical term for ice age.

✓ **global** *adjective* affecting the whole world.

✓ **global warming** *noun* o gradual increase in the world's temperatures, believed to be caused, in part at least, by the **greenhouse effect.**

✓ **greenhouse effect** *noun* an increase in the earth's atmosphere of the amount of carbon dioxide and other gases, which trap the heat of the sun and prevent it escaping into space; this is thought to be o cause of **global warming.**

✓ **greenhouse gas** *noun* a gas, such as carbon dioxide, that is emitted into the atmosphere and adds to the greenhouse effect. **greenhouse** *noun* a building in a garden, etc which has a glass roof and sides and is used for growing plants which need more warmth and protection than they will get outside.

✓ **ice age** *noun* time in the past when temperatures were extremely low and glaciers formed over large parts of the earth. *See* **glacial period.**

✓ **implication** *noun* 1) a possible effect or result 2) something that is suggested, although not directly stated **imply** *verb* to suggest that something is a fact, without stating it directly.

✓ **industrialized** *adjective* of a country which has adopted industrial methods of production and manufacturing.

✓ **monitor *verb*** to check something at regular intervals in order to find out any changes or developments **monitoring** *noun* the act of monitoring something.

✓ **pollution** *noun* the act or process of causing something, such as the environment, air or water, to become dirty, harmful or unfit for use. **pollute** *verb* to cause something to become dirty, harmful or unfit for use. **pollutant** *noun* something which pollutes.

✓ **scaremongering** *noun* the deliberate spreading of frightening rumours.

✓ **sink** *noun* 1) *(also called* **carbon sink**) something, especially forest land, which absorbs **greenhouse** gases, such as carbon dioxide, and so reduces the volume of these in the atmosphere. 2) a large open container in a kitchen which has taps and pipes attached to it for the supply and removal of water.

✓ **summit** *noun* 1) a meeting of heads of governments or other high-ranking officials to discuss matters which are important to all of them. 2) the top of a mountain.

✓ **target** *noun* 1) a result or goal which you are trying to achieve 2) an object which is aimed at in shooting practice, darts, etc, often a round board with circles on it. **target** *verb* to aim or direct something at someone.

✓ **unprecedented** *adjective* not having occurred before.

**Vocabulary Building**

Task 1. Match each word in Column A with its meaning in Column B. Write the corresponding letter in the box next to the word.

| **Column A** | | **Column B** |
|---|---|---|
| 1. concerned | | a. goals |
| 2. climate en- | | b. gave out |
| 3. disasters | | c. serious accidents |
| 4. emitted | | d. take in |
| 5. pollution | | e.process of making impure |
| 6. absorb | | f. amount |
| 7. volume | | g. weather |
| 8. targets | | h. worried |

Task 2. Match each word in Column A with its opposite meaning in Column B. Write the corresponding letter in the box next to the word.

| **Column A** | | **Column B** |
|---|---|---|
| 1. gradually | | a. slow |
| 2. naturally | | b. released |
| 3. warming | | c. unimportant |
| 4. serious | | d. destroy |
| 5. harmful | | e. artificially |
| 7. create | | g. quickly |
| 8. rapid | | h. harmless |

Task 3. Choose the most appropriate word, provided in italics, to complete each of the sentences.

*activity experts incidence politicians representatives*

1.The _____ of crimes has fallen since the police started their patrols.

2. Yoko felt honoured to be one of the school _____ , at the youth conference.

3. You will hear the views of _____ from both the government and the opposition party.

4. What is the reason for all this _____in this quiet area?

5. The company is inviting some_____ to advise them on reorganizing.

**Read and Understand**

Task 1. Say whether each of the sentences below is True or False.

| | |
|---|---|
| 1. The ice ages or glacial periods are examples of climate changes in the past. | True / False |
| 2. Past climate changes happened gradually and naturally. | True / False |
| 3. The climate changes today are similar to those of the past. | True / False |
| 4. Rising global temperatures can cause more flooding and droughts. | True / False |
| 5. Greenhouse gases are given out by plants. | |

Task 2. Answer these questions in full sentences.

1. What causes greenhouse gases to be formed?
2. What did the countries at the summit meeting in Kyoto agree to do about climate change?
3. At the summit meeting in Kyoto, what was suggested for countries to do?

**Pair Work**

With your partner, first discuss your answers to the questions below. Then write out each of your answers in one or two sentences.

1. Name one of the industrial activities that emit greenhouse gases.
2. Give one reason why politicians are concerned about global warming.
3. Name one thing an individual can do to cut down the amount of greenhouse gases produced.

**Spot the Error**

Task 1. In each sentence below, you will find an error with the subject-verb agreement (concord). Underline the error and rewrite the sentence by using the correct concord.

*Sentence with error:* Climate changes occur even in the past.

*Corrected sentence:* Climate changes *occurred* even in the past.

1. Human activity today caused climate change.
2. If the Earth's temperature kept rising, there will be natural disasters.
3. Carbon dioxide was one of the greenhouse gases.
4. The Kyoto summit take place in 1997.
5. It was stated that the countries do not meet their targets for reducing emissions.

Task 2. Complete the sentences below by giving your view.

1. I think there is a need for public education about global warming because_____.
   *OR* I think there is no need for public education about global warming because _____.
2. I think individuals can do nothing about climate change because_____.
   *OR* I think that individuals have a part to play in climate change because_____.
3. I want to play my pan in climate change because _____.

## Text 4. Endangered Species

### Pre-Reading Questions:

1. Name a few endangered species. (Endangered species are animals or insects that are in danger of being destroyed completely)
2. Why would animals be in danger of being destroyed completely?
3. Are you concerned for endangered species? Why or why not?

### Reading Passage

Now read the passage below. You can look up the meanings of the words and phrases in bold in the Vocabulary Study section that follows.

Most of us are now aware of damage which our modern way of life is doing to the **environment**. This includes the harm which we are **inflicting on** many animals. Indeed, we are in danger of **wiping out** some **species**, if we haven't already done so.

For millions of years, **extinction** among animals was a natural process. In fact, it was part of the process of **evolution**. In recent year, however, the extinction of some species has been the result of human activities. Had it not been for these, many more animals would have **survived**.

Some species have either been made extinct, or become **endangered**, because of hunting. Now, the very earliest of humans were hunters, since they ate the flesh of animals and clothed themselves in their skins, and doubtless their hunting gradually contributed to the extinction of some species. However, it was the introduction of guns, with their accurate aim, which put certain animals at great risk and from the nineteenth century on several species, was **on the brink of** the extinction.

By this time, animals were being hunted for commercial purposes apart from the provision of food and clothing. For example, elephants were being hunted for their **ivory**. Nowadays, attempts are being made to **regulate** such **wholesale** commercial hunting, but it is difficult to control in some areas. Thus, animals continue to die to make profits for humans. Of course, not only commerce is to blame. Hunting as a sport has also played a part in the extinction of certain species.

A more modern threat for many animals is the destruction of their environment and the resultant changes in the **ecology** of whole areas. Our use of **pesticides** and other chemicals has **polluted** both soil and water, and this **pollution** has proved to be **toxic** to many of the plants which are part of the **habitat** of many animals. Furthermore, we regularly **lay waste to** land previously inhabited by animals, in order to make way for expanding populations or, as in the case of **deforestation**, to provide goods for wealthy nations.

Modern living has had a **deleterious** effect on the **ecosystem**. We must try to **reverse** this to save our **wildlife**.

### Vocabulary Study

✓ **brink, on the brink of** very close to the point at which something new, often something exciting or dangerous is about to begin.

✓ **deforestation** *noun* the cutting down or burning of trees in a large area.

✓ **deleterious** *adjective* (formal) damaging or harmful.

✓ **ecological** *see* ecology.

✓ **ecology** *noun* the relationship between human, animal and plant life and its-environment; **the ecosystem** *noun* all the living creatures and plants in a particular area, together with their environment or habitat, often considered in relationship to each other.

✓ **endangered** *adjective* used especially of plants and animals which are in danger of being made extinct; at risk of being harmed or destroyed. **endanger** *verb (formal*).

✓ **environment** *noun* the external surroundings in which people, animals and plants live. **environmental** *adjective.*

✓ **evolution** *noun* the gradual development, especially of living things. into more complicated forms. **evolutionary** *adjective (formal of technical)* connected with evolution, **evolve** *verb.*

✓ **extinction** *noun* the making extinct of something. **extinct** *adjective* no long-er existing

✓ **habitat** *noun* the natural surroundings in which a plant or animal usually lives.

✓ **inflict** *verb* to cause someone to experience something extremely un-pleasant.

✓ **ivory** *noun* a hard yellowish-white substance of which 'he tusks of elephants are formed.

✓ **pesticid**e *noun* chemical substance that is used to kill pests, especially in-sects which are considered harmful to crops, etc.

✓ **pollution** *noun* the act or process of rousing something, such as the envi-ronment, air or water, to become dirty, harmful or unfit for use, **pollute** *verb* to cause something to be dirty, harmful or unfit for use.

✓ **pollutant** *noun* something which pollutes.

✓ **regulate** *verb* to control something by the use of rules and laws, **regulation** *noun* an official rule.

✓ **reverse** *verb* 1) to charge something completely so that it is the opposite of what it was, 2) to go or drive backwards, **reverse** *adjective* apposite.

✓ **species** *noun* a group into which animals or plants are abided because they have some similar characteristics and can breed with each other.

✓ **survive** *verb* to continue to live or exist, often in spite of great difficulty or danger, **survival** *noun* the act or state of surviving, **survivor** *noun*.

✓ **toxic** *adjective* poisonous, **toxin** *noun* (often technical or formal) a poison-ous substance.

✓ **waste, lay waste to** *(formal)* to destroy somewhere completely.

✓ **wholesome** *adjective and adverb* 1. on a very large scale, affecting a great many people or things without consideration of individual cases. 2. relating to goods which are bought and sold in large quantities, usually in order to sell them to other people in small quantities at higher prices.

✓ **wildlife** *noun* animals, birds and insects which live in their natural surround-ings and are not domesticated; the word is sometimes also used to include plants.

✓ **wipe out** *verb* to kill or destroy completely.

**Vocabulary Building**

Task 1. Match each word in Column A with its meaning in Column B. Write the corresponding letter in the box next to the word.

| **Column A** | | **Column B** |
|---|---|---|
| 1. inflicting | | a. no longer existing |
| 2. evolution | | b. types |
| 3. survived | | c. development of living things |
| 4. extinct | | d. continued to exist |
| 5. species | | e. poisonous |
| 6. commercial | | f. turn around |
| 7. toxic | | g. causing harm |
| 8. reverse | | h. having to do with business |

Task 2. Match each word in Column A with its opposite meaning in Column B. Write the corresponding letter in the box next to the word.

| **Column A** | | **Column B** |
|---|---|---|
| 1. modern | | a. imprecise |
| 2. accurate | | b. stop |
| 3. provision of | | c losses |
| 4. continue | | d. diminishing |
| 5. profits | | e. lack of |
| 6. whole | | f. currently |
| 7.previously | | g. traditional |
| 8. expanding | | h. part |

Task 3. Choose the most appropriate word, provided in italics, to complete each of the sentences.

*damage natural species environment pesticides*

1. The health farm is set in a rural_____, away from the city.
2. The accident caused some _____to the building.
3. Being without _____ resources, the country decided to develop a knowledge economy.
4. People who buy organic vegetables know that it is grown without _____.
5. The leatherback turtle is one _____ that may become extinct.

**Read and Understand**

Task 1. Say whether each of the sentences below is True or False.

| | |
|---|---|
| 1. The modern way of life is causing some animal | True / False |
| 2. The extinction of animals has only happened in recent times. | True / False |
| 3. In modem times, animals are killed for commercial purposes and for sport. | True / False |
| 4. The use of pesticides is harmful to plants, but not to animals. | True / False |
| 5. The cutting down of forest trees is harmful to animals. | |

Task 2. Complete these sentences, taking information from the passage.

1. In the past, hunters killed animals for_____.
2. Pesticides and other chemicals are toxic to_____.
3. Pesticides and other chemicals lay waste to_____.

**Pair Work**

With your partner, first discuss your answers to the questions below. Then write out each of your answers in one or two sentences.

1. Would you buy a product made of ivory? Why or why not?
2. What more should be done to prevent some animal species from becoming extinct?
3. Why do you think the writer said that it is difficult to stop the killing of animals for commercial purposes?

**Spot the Error**

Task 1. In each sentence below, you will find an error with the subject-verb agreement (concord). Underline the error and rewrite the sentence by using the correct concord.

*Sentence with error:* Animals may become extinct when their environment <u>are</u> damaged.

*Corrected sentence:* Animals may become extinct when their environment *is* damaged.

1. The tiger in that country arc an endangered species.
2. In this area, people is not allowed to cut down trees without permission.
3. All the newspapers reports on the damage caused by the floods.
4. The drinking water contain a high level of pollutants.
5. Elephants was hunted for their ivory.

Task 2. Complete the sentences below by giving your view.

1. I think that the killing of animals for sport is wrong because ___.

*OR* I do not think that the killing of animals for sport is wrong because ___.

2. I think that the government can do more to save endangered species by __.
3. I agree that some modern activities have been harmful to animals because _.

*OR* I disagree that some modern activities have been harmful to animals because ___.

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