ENGLISH IN TERMS OF BIOLOGY

Учебно-методическое пособие

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Целью данного пособия является развитие иноязычной коммуникативной компетенции бакалавров биологического профиля посредством формирования лингвистической базы для решения академических и научно-исследовательских задач будущих специалистов. Структурное содержание пособия включает в себя ряд аутентичных текстов, нацеленных на развитие умений реферирования и аннотирования, а также задания по написанию и составлению презентаций научно-популярных докладов, основанных на научных интересах бакалавров биологического профиля подготовки. Данное пособие состоит из трех разделов, тематически связанных друг с другом.

Рекомендовано УМО РАЕ по классическому университетскому и техническому образованию в качестве учебно-методического пособия для студентов высших учебных заведений, обучающихся по направлению подготовки: 06.03.01 – «Биология»

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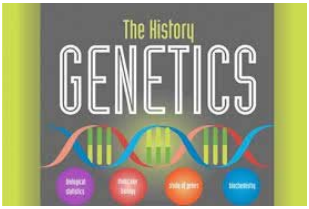
Part 1.

Lesson I. The History of Genetics



In this chapter, you will:

- learn about the origins of genetics and its brief history;
- define the scope of the science of genetics;
- determine the terms and the dates associated with Genetics;
- comment on such notions as "Mendelian genetics", the "Mendelian method", "Mendel's laws";
- gain insight into the mechanism of molecular biology, which has never stopped revealing the complexity of the way in which hereditary material functions.

Learn the following key terms and names:

allele (n)	individual (n)
cross (n)	segregate (v)
gene (n)	segregation (n)
genetic (adj)	rediscover (v)
genotype (n)	reproduce (v)
heredity (adj)	reproduction (n)
homozygote (n)	peas (n) –pl.
heterozygote (n)	species (n)
hybridization (n)	variety (n)

Reading

A. Read the text once and answer the questions:

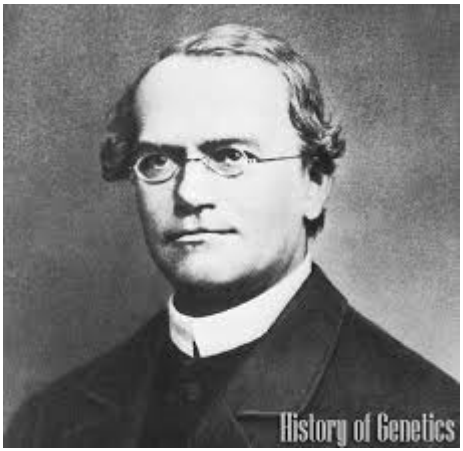
1. Where are the origins of genetics to be found?
2. When was the term "genetics" coined? What did it designate?
3. Could you comment on such notions as "Mendelian genetics", the "Mendelian method", "Mendel`s laws"?
4. What was the material basis of heredity?
5. When was genetics born?
6. What world-famous scientists rediscovered Mendel`s laws?
7. What contribution to genetics did each previously mentioned scientist make?

The origins of genetics are to be found in Gregor Mendel's memoir on plant hybridization (1865). However, the word 'genetics' was only coined in 1906, to designate the new science of heredity. Founded upon the Mendelian method for analyzing the products of crosses, this science is distinguished by its explicit purpose of being a general 'science of heredity' and by the introduction of totally new biological concepts (in particular those of gene, genotype, and phenotype). In the 1910s, Mendelian genetics fused with the chromosomal theory of inheritance, giving rise to what is still called 'classical genetics'. Within this framework, the gene is simultaneously a unit of function and transmission, a unit of recombination, and of mutation. Until the early 1950s, these concepts of the gene coincided. But when DNA was found to be the material basis of inheritance, this congruence dissolved. Then began the venture of molecular biology, which has never stopped revealing the complexity of the way in which hereditary material functions.

In a letter to his colleague Adam Sedgwick in 1905, the English biologist William Bateson (1861-1926) used the word 'genetics' to designate 'the science of heredity and variation'. Bateson was then known as one of the major Mendelians in the world, and proposed using the word 'genetics' to name the chair that was created for him at Cambridge in 1906. In the end, Bateson's chair was named chair of biology but on the occasion of the third International Conference on Plant hybridization, Bateson proposed that the new science of heredity based on Mendel's laws be named "genetics'. This proposal was enthusiastically approved at the 1906 Conference, and was published in 1907 as 'Report of the Third International Conference 1906 on Genetics'. This periodical meeting still exists. In spite of deep theoretical changes, some of which are described hereafter, the scientific discipline of genetics has maintained itself.

Origins of genetics: from Mendel to Mendelism

When was genetics born? Was it in 1866, year of the publication of Mendel's memoir on plant hybridization? Or in 1900, when three botanists, Hugo de Vries in the Netherlands, Carl Correns in Germany, and Erich von Tschermak in Austria, independently rediscovered Mendel's laws? Or in 1902 when Bateson's book*, A Defence of Mendel's Principles of Heredity,* explicitly connected Mendel's laws with the general question of 'heredity'. Or in 1906,



when Bateson first made public use of the word with reference to Mendel? There cannot be a definitive answer to this question. Mendel's experimental work on peas was crucial, but only in a methodological sense. Mendel's intention was not to offer general laws of heredity, but only a ‘law of the development of hybrids' in plants; furthermore, Mendel's memoir remained largely unknown until 1900, when his ‘laws’ (plural instead of singular) were rediscovered. This rediscovery would also be an ambiguous date of birth for genetics, because those who rediscovered it did not intend to propose general laws of heredity either, but only of hybridization. Bateson's 1902 book was certainly a key event, because it showed that Mendel`s first law (the law of segregation applying to just one character) applied not only to plants but also to animals. Bateson also defended that the Mendelian laws of hybridization did not apply only to the results of crosses between individuals of distinct varieties or species, but to a huge number of individual hereditary differences among virtually all sexually reproducing organisms. This book also

introduced a technical vocabulary that rapidly became indispensable for all Mendelians: 'allelomorph' (or, more simply. 'allele'), 'homozygote' and the 'heterozygote'; these terms imply that for a given character transmitted in a Mendelian way, each individual has two (and exactly two) physical versions of the same hereditary element - an idea that Mendel did not suggest.

(Source: Ananya Mandal, History of Genetics URL: https://www.news-medical.net/life-sciences/History-of-Genetics.aspx)

B. Read the text again. Mark the sentences T (true) or F (false). Correct the false ones:

1. The origins of genetics are to be found in the works written by Carl Linneus.
2. In the 1920s, Mendelian genetics fused with the chromosomal theory of inheritance, giving rise to what is still called "classical genetics."
3. When DNA was found, it served the material basis of inheritance.
4. The English biologist William Bateson (1861-1926) used the word "genetics" to designate " the science of heredity and variation".
5. In 1907, the three botanists from various countries independently rediscovered Mendel`s laws.
6. In his book (1902) Bateson did not manage to show that Mendel`s ideas applied to a huge number of individual differences among virtually all sexually reproducing organisms.
7. Genetics as a scientific discipline was the result of a complex intellectual history.

C. Make a summary of the text:

Making a summary

1. **A summary begins with an introductory sentence** that states the article's title and author.
2. **A summary must contain the main thesis restated in your own words.** (To do this, first find the thesis statement in the original text.)
3. **A summary is written in your own words.** It contains few or no quotes.
4. **A summary is always shorter than the original text, often about 1/3 as long as the original.**
5. **A summary should contain all the major points of the original text**, and should ignore most of the fine details, examples, illustrations or explanations.
6. **The backbone of any summary is formed by crucial details** (key names, dates, events, words and numbers).
7. **A summary must contain only the ideas of the original text.** Do not insert any of your own opinions, interpretations, deductions or comments into a summary.

Useful language

Introduction:

1. The primary purpose of the paper is…
2. The paper (article) begins with a short discussion…
3. The first paragraph deals with…
4. At first (at the beginning) the author points out that (describes, notes, emphasizes) …
5. To begin with; Firstly; In the first place…
6. Research began with…

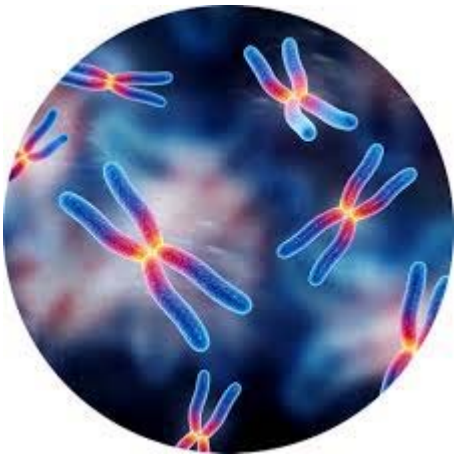
Main Body:

1. Then follows a discussion on …
2. The next (following) paragraph deals with …
3. Then the author goes on to the problem of…

4. After discussing… the author turns to…
5. Next (further, then) the author explains that...
6. It must be emphasized that…; It should be noted that… It is interesting to note that…
7. The final paragraph states (describes, ends with) …

Conclusions:

1. The author concludes with the statement that … (summarizes)…
2. To sum up (to summarize, to conclude; to make (draw) a conclusion).



Talking points

Discuss in small groups:

1. Trajectories of genetics, 150 years after Mendel.
2. The rediscovery of genetics. Mendel`s theories and the concepts of the other scientists.
3. The result of Mendel`s research used to improve the way we live.

Writing

Write an essay about the results of Mendel`s research and a huge impact of genetic theory on our lives.

Lesson II

The Evolution of Epigenetics: From Prokaryotes to Humans and Its Biological Consequences

In this chapter, you will:

- learn about the mechanism of gene selection and epigenetics;
- determine the terms associated with the evolution of epigenetics;
- differentiate the mechanism between prokaryotes and eukaryotes;
- see a significant role of epigenetics in the process of embryogenesis;
- provide a comparative analysis on the above-mentioned aspects.

Learn the following terms and names:

alter (v)	obesity (n)
alteration (n)	protein (n)
acetylation (n)	prokaryotes (n)
eukaryotes (n)	stroma (n)
epigenetics (n)	tumour (n)
carcinogen (n)	reversibility (n)

chromosome (n)	reversible (adj.)
alteration (n)	consequently (adv.)
cell (n)	result in (v)
cellular (adj.)	lead to (v)
extracellular (adj.)	thus (adv.)
mitosis (n)	

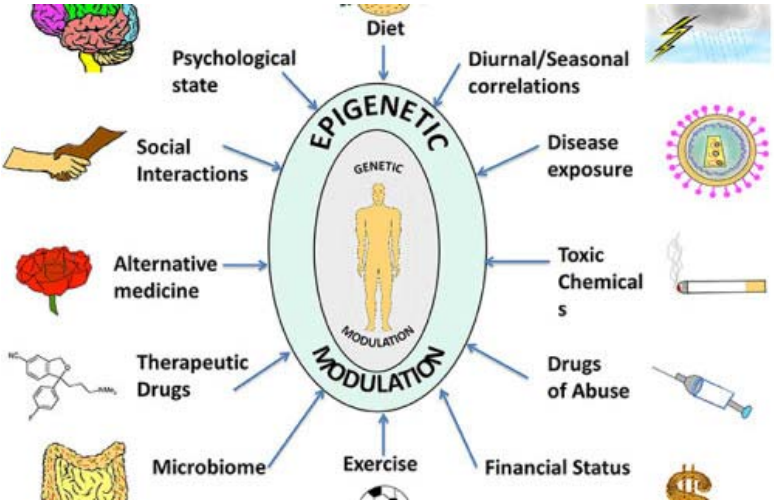
Reading

A. Read the text once and answer the questions:

1. What factors does the evolution process include?
2. What was the result of the evolutionary development?
3. Epigenetics plays a significant role in the conserved process of embryogenesis and human development, doesn't it?
4. What is the essence of epigenetics?
5. Does the external world have a significant impact on cellular regulation? How can its impact be expressed?
6. May natural selection act on this chain of events and thus influence evolution?
7. What is tumour initiation associated with?
8. Can you comment upon the tittle of the article concerned?

The evolution process includes genetic alterations that started with prokaryotes and now continues in humans. A distinct difference between prokaryotic chromosomes and eukaryotic **chromosomes** involves histones. As evolution progressed, genetic alterations accumulated and a mechanism for gene selection developed. It was as if nature was experimenting to optimally utilize the gene pool without changing individual gene sequences. This mechanism is called epigenetics, as it is above the genome. Curiously, the mechanism of epigenetic regulation in prokaryotes is strikingly different from that in eukaryotes, mainly higher eukaryotes, like **mammals**. In fact, epigenetics plays a significant role in the conserved process of embryogenesis and human development. Malfunction of epigenetic regulation results in many types of undesirable effects, including cardiovascular disease, metabolic disorders, autoimmune diseases, and cancer. This review provides a comparative analysis and new **insights** into these aspects.

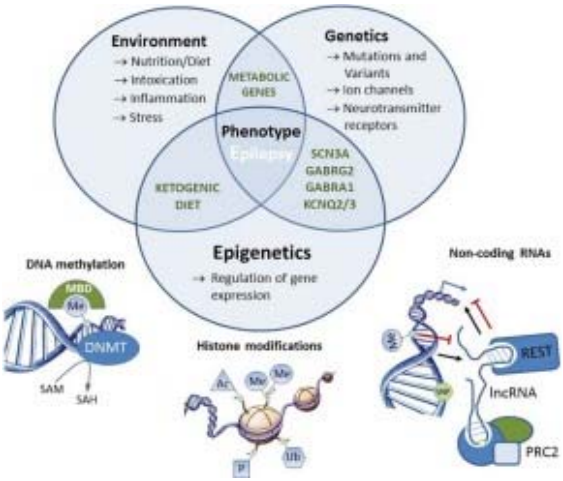
What is Epigenetics? Epigenetics is a mechanism of gene transcription regulation that does not change the DNA sequence and is usually reversible. The reversibility of this phenomenon provides the opportunity for these cells to utilize the existing gene pool in different ways, as necessary, without permanently altering the content of the gene pool. During the course of development, from prokaryotes to mammals, a mechanism arose by which



specific functions in terms of the regulation of gene expression could be performed. Thus, the epigenetic alterations are somewhat different in varying cell types and cells from different origins. The broad mechanisms by which these changes occur are methylation-demethylation, acetylation-deacetylation, and other modifications of histones, and also methylation-demethylation of specific regions in DNA on a finer scale. These interactions manipulate the affinity of histone binding and the topology of the DNA that winds around them. Consequently, the transcription of genes is affected by the ability or inability of proteins to bind to regulatory regions in open or condensed chromatin, respectively. Furthermore, the transcriptional regulation by epigenetic mechanisms is critical in the development in which changes

determine the differentiation of cells into different cell types with specific functions.

Epigenetics and the Environment



The external world, inclusive of food, toxins, carcinogens, and many other day-to-day factors, has a significant **impact** on cellular regulation. These environmental factors have the potential to directly alter the DNA sequence, and they can also induce DNA methylation and histone modifications. Thus, exposure to particular environments has the potential to shift cellular equilibrium and create a microenvironment that is suitable for tumorigenesis or the development of other debilitating diseases. It has been shown that the activity of enzymes regulating the structure and activity of chromosomes is sensitive to environmental changes; thus, environmental agents may alter gene expression. This may **result in** widespread changes in cells that can propagate throughout the body by mitosis and evolve into

a heritable epigenetic change. Natural selection may act on this chain of events and thus influence evolution.

A common example of the epigenetic impact of the environment and the related health outcomes is lead exposure and its consequences. Recent studies **suggest** that lead **exposure** in children can change DNA methylation, histone modification, and miRNA expression, which may result in neurodegenerative diseases in adult life. Similarly, it is well known that carcinogen exposure can **cause** direct DNA damage and lead to cancer. However, carcinogens can also influence the microenvironment through epigenetic effects on epithelial cells, stromal cells, extracellular matrix **constituents**, and immune cells, resulting in tumour development. Tumour initiation is associated with the recruitment of these components as well as the production of cytokines. It has been shown that, carcinogen exposure can result in gene methylation changes in stromal cells, resulting in breast prostate and some squamous cell carcinomas. In addition, exposure to nongenotoxic agents has been found to lead to methylome changes in the supporting cellular stroma. As an example, exposure to low-level benzene has been linked to both hypomethylation and hypermethylation of the p15 tumour suppressor gene promoter element in myeloid leukemia.

Perhaps more surprisingly, epigenetic changes can result from the influence of nutrients and bioactive food components. These changes include DNA methylation and histone modifications.

One study suggests that nutrition affects the aging process and cancer development, as well as adult **obesity** and the development of diabetes by these kinds of epigenetic changes.

Thus, the evolution of epigenetics is characterized by the shift of epigenetic regulation of prokaryotes, to lower eukaryotes to higher eukaryotes, to humans.

(**Source**: *Amber Willbanks, Meghan Leary, Molly Greenshields, Camila Tyminski. The Evolution of Epigenetics: From Prokaryotes to Humans and its Biological Consequences. Genetics & Epigenetics. – USA, 2016. – pp. 25-26.*)

B. Look at highlighted words and phrases. Try to work out their meaning. Then match them to 1-10.

1. An organized package of DNA found in the nucleus of the cell;
2. The animals (humans, dogs, lions, wolves);
3. The results or effects of something;
4. An accurate and deep understanding;
5. Make (something, especially something bad) happen;
6. To propose; to put forward a plan or idea for someone to think about;
7. A component part of something;
8. The state of having no protection from something harmful;
9. To cause a particular situation to happen;
10. The state of being grossly fat or overweight;

C. Make a summary of the text

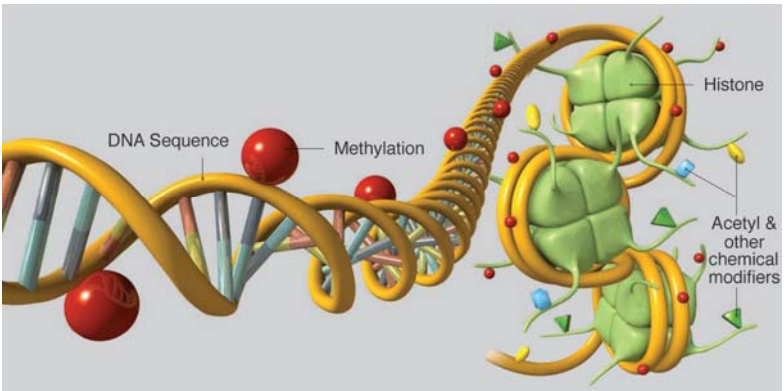
Talking points

Discuss in small groups:

1. The concept of epigenetics and its interpretation.
2. The origin of the term and its brief history.
3. The examples of the application(s) of epigenetics.

Writing

Write an essay about the evolution of Epigenetics.



Lesson III

Melatonin: a potential regulator of plant growth and development

In this chapter, you will:

- learn about the recent research done with regard to melatonin;
- review the recent advancements in melatonin research in plants;
- determine the terms associated with melatonin study;
- highlight the history of melatonin and its areas and directions of future research;
- comment on the potential for melatonin and serotonin to act as regulators of plant developmental responses.

Learn the following terms, words and expressions:

acetic acid (adj +n)	pineal gland (adj +n)
antioxidant (n)	protein (n)
alga (n) – algae (n, pl.)	physiology (n)
auxin (n)	physiological (n)
dinoflagellate (n)	physiological (adj.)
organogenesis (n)	receptor (n)
metabolism (n)	response (n)
metabolic (adj)	tryptophan (n)
modulation (n)	

Reading

A. Read the text and answer the questions:

1. What has recent research relating to melatonin reported?
2. How is melatonin synthesized?
3. In what species is melatonin present?
4. Is melatonin an effective free radical scavenger and antioxidant?
5. What does the current review of melatonin examine?
6. Are there any promising results and exciting directions in the study of melatonin?
7. What could future areas of research into melatonin include?

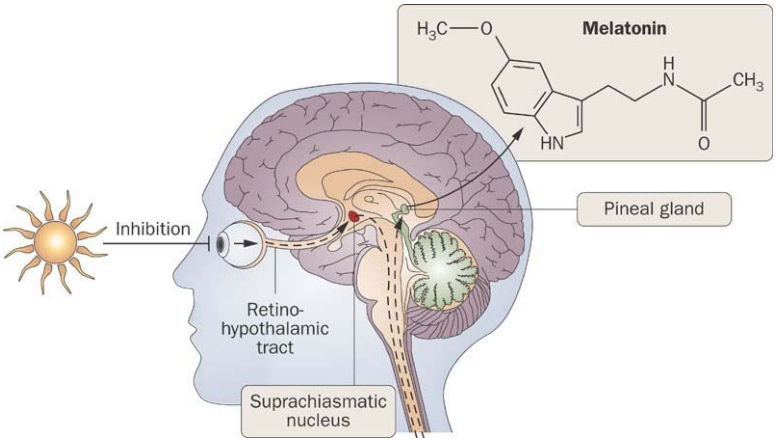
Recent research has reported the presence of melatonin (N-acetyl-5-methoxytryptamine), a mammalian indole amine neuro hormone, in higher plants, indicating that melatonin may be an important metabolic regulator that has been highly conserved across biological kingdoms. Melatonin is synthesized from tryptophan in the mammalian pineal gland, and a similar biosynthetic pathway was recently described in St. John's wort shoot tissues, wherein radiolabel from tryptophan was recovered in serotonin and melatonin as well as indole acetic acid. There is growing information describing melatonin control of physiological processes in mammals, yeast, and bacteria, including diurnal responses, detoxification of free radicals, and

environmental adaptations. However, at the current time, there is no known specific role for melatonin in plant physiology. Alterations in melatonin concentrations in plant tissues have been shown to affect root development, mitosis, and mitotic spindle formation. The recent advancements in melatonin research in plants and some directions for important areas of future research are reviewed in this article.

MELATONIN: A HISTORY

Melatonin (N-acetyl-5-methoxytryptamine) is synthesized in the pineal gland of mammals, and the circulation of micro-quantities of the hormone regulate the most basic physiological processes. Melatonin has only recently been identified and quantified in higher plant species and these results support the hypothesis that melatonin is a ubiquitous, highly conserved molecule. There are currently more than 5700 reports of the presence of melatonin in diverse species ranging from mammals, insects, planarians, mollusks, dinoflagellates, and algae to grains, vegetables, and medicinal plants used in the treatment of neurological disorders. In mammals, melatonin influences physiological responses that include sleep rhythm disorders, geriatric insomnia, jet lag,

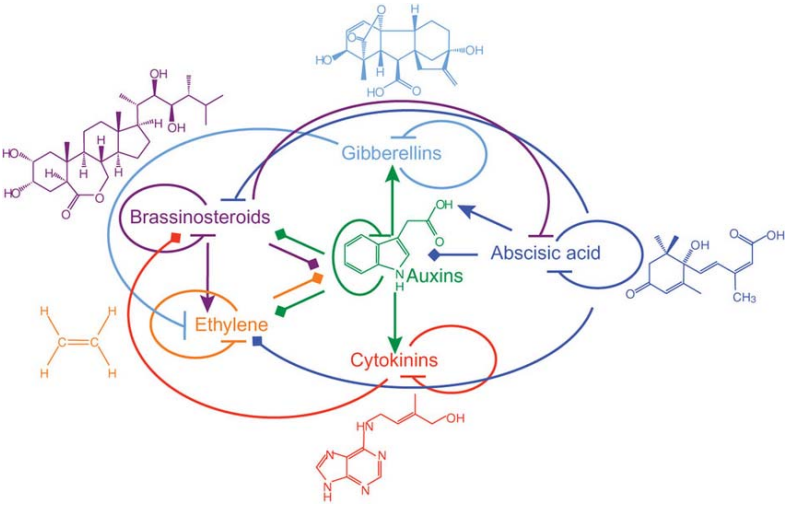
epilepsy, seasonal affective disorder, pain, gastric ulcers, cancer, body temperature, reproduction, and migraine headaches. The function of reproductive systems in photoperiodically dependent rodents is largely controlled by the release of melatonin from the pineal gland. In addition, melatonin is an effective free radical scavenger and antioxidant. Recently, plant melatonin was shown



to modulate ***de novo*** root and shoot organogenesis in St. John's wort ***(Hypericum perforatum*** L.). The current review examines the reports of melatonin in higher plants and the potential for future investigations in this area to the oscillations of the complementary metabolite serotonin. Serotonin also stimulates phosphoinositide (PI) turnover, releasing second messengers in plant and animal systems.

Although research into the role of melatonin in plant metabolism is in its infancy, there are promising results and exciting new

directions to be pursued.



The evidence seems to indicate that melatonin may provide a dark signaling mechanism in higher plants similar to the role of the hormone in other systems. In this case, melatonin would play an integral part in plant responses to alterations in light level or duration of dark periods. Preliminary evidence of this potential was seen in the modulation of root organogenesis in St. John's wort (Mureh- et al., 200 P). In addition, the potential for melatonin to act as an antioxidant to maintain cellular stability may provide an important mechanism for the survival of many plant species. Therefore, the potential for melatonin and serotonin to act as regulators of plant developmental responses is enormous and new research should be initiated in this area. Future areas of research could include a reinvestigation of classic phytohormone-

regulated systems for short-term and long-term responses, identification of receptors and melatonin binding proteins that could be used to impair melatonin metabolism in plant model systems, and the interaction of melatonin with other growth regulators, including auxin.

(Source: Susan J. Murch; Praveen K. Saxena. Melatonin: A potential regulator of plant growth and development. November 2002, Volume 38, Issue 6, pp 531–536)

B. Match the words with the definitions.

1) Tissue	b. a cell or organ in the body which produces chemical substances which the body needs in order to function
2) Reproduction	d. N – acetyl -5 – methoxytryptamine synthesized in the pineal gland of mammals which helps to regulate most physiological processes.
3) Hormone	f. the way by which chemical processes in your body cause food to be used in an efficient way producing energy.
4) Cancer	a. a chemical usually occurring naturally in our body that stimulates its certain processes.
5) A gland	g. a fundamental property of a living system to give rise to organisms of the same kind.

6) Metabolism	c. a group of similar cells in plants and animals performing the same function.
7) Melatonin	e. an animal such as a human being , a dog, a lion, and a whale.
8) A mammal	h. a serious disease in which cells in a person's body increase rapidly in an uncontrolled way, producing abnormal groups.

C. Make a summary of the text

Talking points

Discuss in small groups:

1. Recent research into melatonin.
2. The properties and the functions of melatonin.
3. Melatonin as a potential regulator of plant growth and development.
4. The potential of melatonin for future research in this area.

Lesson IV

Polymerase Chain Reaction: Types, Utilities and Limitations

In this chapter, you will:

- learn about advances and applications of research in biochemistry and genetics in the field of health sciences;
- determine the terms and abbreviations associated with the Polymerase Chain Reaction (PCR);
- highlight the use of the PCR among the applications of molecular techniques;
- see the mechanisms involved in this methodology;
- discuss the advantages which the PCR technique offers nowadays.

Learn the following terms:

agent (n)	technique (n)
amplify (v)	virus (n)
amplification (n)	specificity (n)
culture (n)	Polymerase Chain Reaction (PCR)
enzyme (n)	DNA - deoxyribonucleic acid (ДНК)
isolation (n)	RNA - ribonucleic acid (РНК)
medium(n) – media (pl)	sequence (n)
primer (n)	

Reading

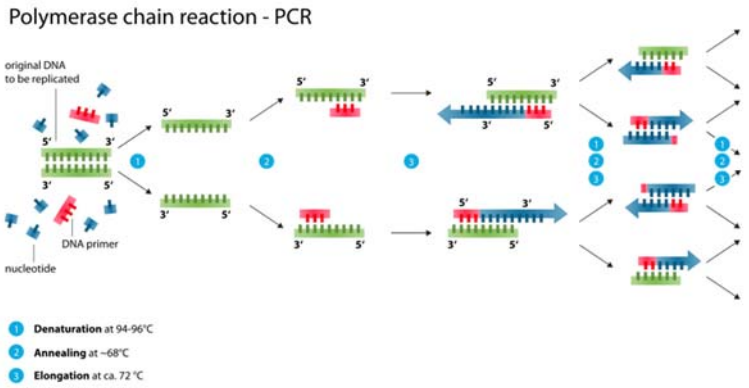
A. Read the text once and answer the questions:

1. What can you say about the recent advances and applications of research in biochemistry and genetics?
2. What does molecular technology deal with?
3. What is the Polymerase Chain Reaction (PCR)?
4. Who developed this technique?
5. Can you describe the mechanisms involved in this methodology?
6. What advantages does the PCR technique offer?

Types, utilities and limitations of PCR

Nowadays, **advances** and applications of research in biochemistry and genetics play an important role in the field of health sciences. The molecular **approach** to the disease has become necessary for a better interpretation of processes and as horizon in the development of new diagnostic and therapeutic strategies. Therefore, techniques in molecular biology have modified diagnosis, **prevention** and control of diseases in living beings. Molecular technology has become a crucial tool for identifying new genes with importance in medicine, agriculture, animal production and health, environment and the industry **related to** these areas. Among the applications of molecular techniques, it is important to highlight the use of the Polymerase Chain Reaction (PCR) in the identification and characterization of viral, bacterial, parasitic and fungal agents. This technique was

developed by Kary Mullis in the mid 80's and since then it has been considered as an essential tool in molecular biology which allows amplification of nucleic acid **sequences** (DNA and RNA) through repetitive cycles in vitro. The mechanisms involved in this methodology **are similar to** those occurring in vivo during DNA replication. Each cycle in Kary Mullis' technique has three temperature patterns **carried out** by a thermocycler. The first pattern of temperature is 94 °C (denaturation), the second one is 45-55°C



(alignment of the specific primers) and the third one is 72 °C (final extension). The amplification of specific nucleic acid sequences, even in the presence of millions of other DNA molecules, is achieved by thermostable DNA polymerase enzyme (as the name of this technique suggests: "polymerase chain reaction") and specific primers. Primers are short sequences of DNA or RNA (oligonucleotides) that initiate DNA synthesis.

These are **complementary** to the template strand of DNA. The total duration of PCR reaction is around two hours; this depends on the specific conditions of the reaction. Therefore, the DNA polymerase enzyme is capable of producing a complementary strand of a template DNA. The synthesized product in each cycle can serve as a template in the next issue of copies of DNA, creating a chain reaction that can **amplify** a specific fragment of DNA.

PCR is a relatively simple technique that can detect a nucleic acid fragment and amplify this sequence. In addition, this technique has other advantages that are described below. This technique offers sensitivity because from small amounts of genetic material can be detected target sequences in a sample. Also this offers specificity due to a specific sequence of DNA being amplified through strict conditions. It is considered a fast technique compared with other methods to detect microorganisms such as bacteria, fungus or virus, which require isolation and culture using culture media or cell lines. Finally, we can mention that versatility due to the genetic sequences from various microorganisms can be identified with the same reaction conditions for diagnosis of different pathologies.

In recent years, modifications or variants have been developed from the basic PCR method to improve performance and

specificity, and **to achieve** the amplification of other molecules of interest in research as RNA.

(Source: P. Hernandez-Rodrigues and A. Gomez Ramirez. Polymerase Chain Reaction: Types, Utilities and Limitations. URL: https://en.wikipedia.org/wiki/Polymerase_chain_reaction)

B. Look at highlighted words and phrases. Try to work out their meaning. Then match them to 1-10.

1) to fulfill, complete, finish;
2) the order in which things or events follow one another;
3) forward movement;
4) to be connected with one another;
5) serving to complete; supplying what is needed for completion;
6) like or alike; of the same kind;
7) a manner or method of doing something;
8) to finish successfully; to gain as the result of action;
9) to make larger; to increase the strength of something;
10) to keep something from happening or stop (someone) from doing something.

C. Make a summary of the text

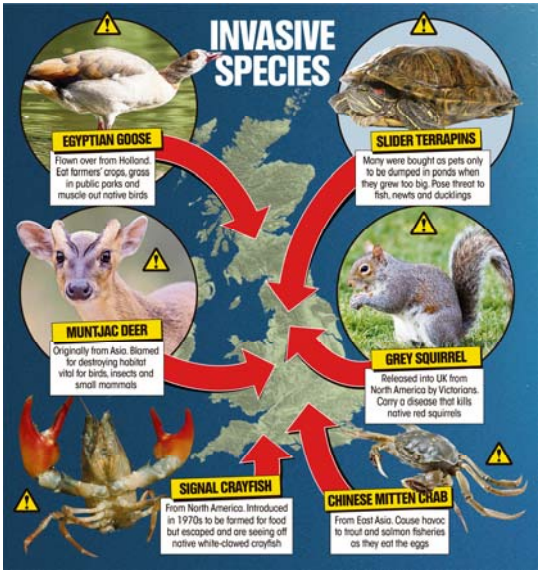
Talking points

Discuss in small groups:

1. Modern advances and applications of recent research in biochemistry and genetics.
2. Present-day techniques used in molecular biology.
3. The Polymerase Chain Reaction (PCR). What are the characteristic features of this technique?

Lesson V

Invasive Animal Species in Great Britain – Alien Species that should not be in the UK



In this chapter, you will:

- learn about invasive or alien species of animals causing problems in most of the countries in the world;
- determine the terms associated with this theme;
- identify some of these invasive animal species which compete with native animals in Great Britain;
- see the difference(s) between native and invasive animal species;
- list the problems caused by invasive animal species in the UK and other countries in the world.

Learn the following terms and names:

adapt (v)	invasive (adj)
adaptation (n)	habitat (n)
alien (adj)	ecosystem (n)
breeding (n)	squirrel (n)
conserve (v)	spider (n)
conservation (n)	scorpion (n)

Reading

A. Read the text once and answer the questions:

1. What do we call invasive animal species?
2. How did they find themselves in the UK?
3. What kind of problems do they cause there?
4. Why is culling of invasive species regarded as a contentious issue?
5. Which kind of squirrel species is bidding to become a dominant one in Great Britain?

Invasive or alien species of animals are causing problems in most of the countries in the world. Just because Great Britain is an island, does not mean that we do not have our fair share of invasive species. Many of the common invasive animal species in the United Kingdom were brought here in the eighteenth and nineteenth century as a part of private menageries or to ornament the country estate of a nobleman. Inevitably some of these

animals escaped and managed to set up breeding colonies. In more modern times, people have started to keep exotic pets and when they have got fed up with caring of them or they become too expensive to keep, they release them into the wild. Yet, more invasive species arrive as stowaways in food imports and packaging, and there is often a story in the British press about exotic spider or scorpion being found in an imported bunch of grapes or bananas.

Some of these invasive animal species have competed with native animals and driven them out and destroyed plant life and habitat, while others, up till now, seemed to have caused no damage to the environment of the British Isles. Culling of invasive species to keep their numbers down is always a contentious issue. On the one hand, there is the need to protect Britain`s native animal species, plants, eco-systems, and on the other hand, these animals are here through no fault of their own and every animal deserves to be treated humanely and not to be killed in a violent, painful manner. Conserving the native species of Britain and the British countryside is an ongoing challenge; but it must be a challenge where the welfare of any invasive animals is taken into account. If it is decided that a cull of an invasive species is absolutely necessary, it needs to be undertaken as humanely and with as little suffering to the animals involved as possible.

Grey Squirrels – UK Invasive Species

Grey squirrels are a familiar sight in the gardens and parks of the United Kingdom. They are very cute animals and it is very amusing to watch them, but it is important to remember that the grey squirrel is not a native British species rodent. Grey squirrels were imported from North America in 1876. They adapted very successfully to life in the UK and it is estimated that there are now around 2 million of them living in the British Isles. They have successfully competed against native red squirrels and driven them from their habitat, so that they only survive in remote pockets of the UK. It is estimated that there are only around 120,000 red squirrels left. Grey squirrels also cause a lot of damage. They gnaw at the bark of trees and damage them and can also cause a lot of destruction if they manage to get into the roofs and attics of people`s houses. They are also endangering native bird species as they get into nests and eat bird`s eggs and they destroy many native plants.

Recently a new squirrel invader from America has appeared in the United Kingdom in the form of the black squirrel. At first it

was thought that these black squirrels were genetically mutations of the local grey squirrel population, but work done by researchers shows that genetically they are descendants of American black squirrels that have escaped from zoos. They are doing to the grey squirrels what the grey squirrels did to red squirrel, which is successfully competing against them and they are bidding to become the dominant squirrel species in Great Britain.

(Source: Wildscreen. UK invasive species fact file.

URL: https://www.arkive.org/uk-invasive-species/)

B. Read the text again and mark the sentences T (true) or F (false). Correct the false ones.

1. Many of the common invasive animal species in the UK were brought to the country only in the nineteenth century.
2. Some of these animals did not manage to escape and set up breeding colonies.
3. In more modern times, people keep exotic pets, take care of them and never release them in the wild.
4. Every animal deserves to be treated humanely and not to be killed in a violent, painful manner.
5. Recently a new squirrel invader from Germany has appeared in the UK in the form of a black squirrel.

6. It is thought that these black squirrels are genetic mutation of the local grey squirrel population.
7. The black squirrels are bidding to become the dominant squirrel species in Great Britain.

C. Make a summary of the text

Talking points

Discuss in small groups:

1. The problems caused by invasive animal species in most of the countries in the world.
2. Comment upon the title of the text which is called “Invasive Animal Species in Great Britain - Alien Species that should not be in the UK”.
3. Protection and conservation of Britain’s native animal species.

Lesson VI

Photosynthesis

In this chapter, you will:

- learn about the process of photosynthesis that sustains all life on the planet Earth;
- determine the terms and abbreviations associated with
- photosynthesis;
- discuss the basic principles and the biochemical basis of
- photosynthesis;
- speak about photosynthesis as the ultimate source of all
- humankind`s food and oxygen;
- differentiate between the light and dark reactions of
- photosynthesis.

Learn the following terms and names:

aerobic (adj)	guard cells (n+n) -pl
chloroplast (n)	membrane (n)
compound (n)	organelles(n) –pl
carbohydrate (n)	stroma (n)
enzyme (n)	thylakoid (n)
epidermis (n)	transpiration (n)
fossilize (v)	turgor (n)

Reading

A. Read the text and answer the questions:

1. How can the term “photosynthesis” be defined?

2. What is this term based on?

3. What do the abbreviations the ATP and NADPH stand for?

4. Photosynthesis is the biochemical process, isn’t it? What are its peculiarities?

5. What reactions may photosynthesis be split into?

6. How many billion tons of oxygen does photosynthesis produce?

7. What are the principal organs of photosynthesis in land plants?

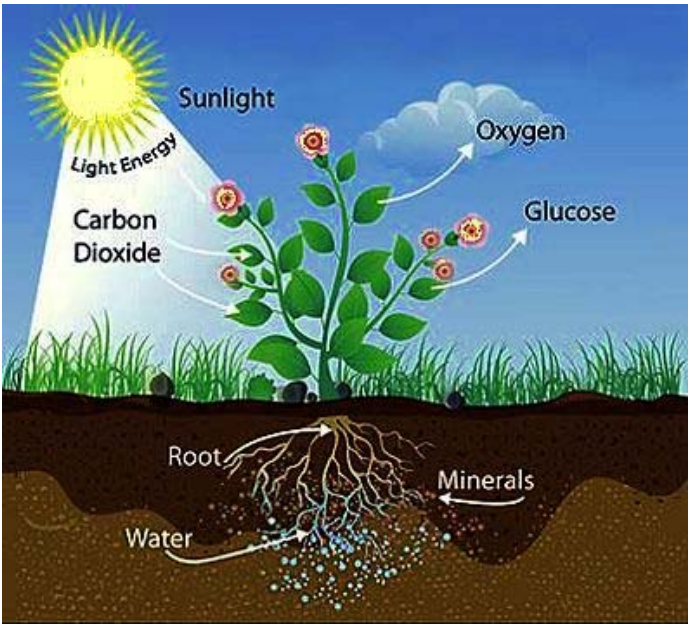
Photosynthesis sustains virtually all life on the planet Earth providing the oxygen we breathe and the food we eat; it forms the basis of global food chains and meets the majority of humankind's current energy needs through fossilized photosynthetic fuels. The process of photosynthesis in plants is based on two reactions that are carried out by separate parts of the chloroplast. The light reactions occur in the chloroplast thylakoid membrane and involve the splitting of water into oxygen, protons and electrons. The protons and electrons are then transferred through the thylakoid membrane to create the energy storage molecules

adenosine triphosphate (ATP) and nicotinomide-adenine dinucleotide phosphate (NADPH). The ATP and NADPH are then utilized by the enzymes of the Calvin–Benson cycle (the dark reactions), which converts CO_2 into carbohydrate in the chloroplast stroma. The basic principles of solar energy capture, energy, electron and proton transfer and the biochemical basis of carbon fixation are explained and their significance is discussed.

An overview of photosynthesis

Photosynthesis is the ultimate source of all of humankind's food and oxygen, whereas fossilized photosynthetic fuels provide ≈ 87% of the world's energy. It is the biochemical process that sustains the biosphere as the basis for the food chain. The oxygen produced as a by-product of photosynthesis allowed the formation of the ozone layer, the evolution of aerobic respiration and thus complex multicellular life.

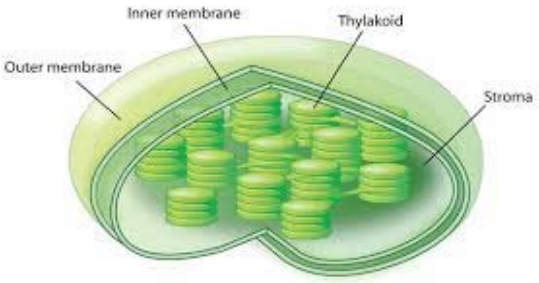
Oxygenic photosynthesis involves the conversion of water and CO_2 into complex organic molecules such as carbohydrates and oxygen. Photosynthesis may be split into the ‘light’ and ‘dark’ reactions. In the light reactions, water is split using light into oxygen, protons and electrons, and in the dark reactions, the protons and electrons are used to reduce CO_2 to carbohydrate (given here by the general formula CH_2O).



Photosynthesis converts ≈ 200 billion tonnes of CO_2 into complex organic compounds annually and produces ~140 billion tonnes of oxygen into the atmosphere. By facilitating conversion of solar energy into chemical energy, photosynthesis acts as the primary energy input into the global food chain. Nearly all living organisms use the complex organic compounds derived from photosynthesis as a source of energy. The breakdown of these organic compounds occurs via the process of aerobic respiration, which of course also requires the oxygen produced by photosynthesis.

The site of photosynthesis in plants

In land plants, the principal organs of photosynthesis are the leaves. Leaves have evolved to expose the largest possible area of green tissue to light, and entry of CO_2 to the leaf is controlled by small holes in the lower epidermis called stomata. The size of the stomatal openings is variable and regulated by a pair of guard cells, which respond to the turgor pressure (water content) of the leaf, thus when the leaf is hydrated, the stomata can open to allow CO_2 in. In contrast, when water is scarce, the guard cells lose turgor pressure and close, preventing the escape of water from the leaf via transpiration.



Within the green tissue of the leaf (mainly the mesophyll) each cell (≈ 100 μm in length) contains ≈ 100 chloroplasts (2–3 μm in length), the tiny organelles where photosynthesis takes place. The chloroplast has a complex structure with two outer membranes (the envelope), which are colourless and do not participate in photosynthesis, enclosing an aqueous space (the stroma) wherein sits a third membrane known as the thylakoid,

which in turn encloses a single continuous aqueous space called the lumen.

The light reactions of photosynthesis involve light-driven electron and proton transfers, which occur in the thylakoid membrane, whereas the dark reactions involve the fixation of CO_2 into carbohydrate, via the Calvin–Benson cycle, which occurs in the stroma. The light reactions involve electron transfer from water to $NADP^+$ to form NADPH and these reactions are coupled to proton transfers that lead to the phosphorylation of adenosine diphosphate (ADP) into ATP. The Calvin–Benson cycle uses ATP and NADPH to convert CO_2 into carbohydrates, regenerating ADP and $NADP^+$. The light and dark reactions are therefore mutually dependent on one another.

(Source: Matthew P. Johnson. Photosynthesis // Essays in Biochemistry. – 2016. №. 60. - P. 255–273.)

Notes: ATP – adenosine triphosphate

B. Match the words with the definitions

1. Oxygen	b. a stratum existing in the upper atmosphere that protects life on earth by filtering out harmful ultraviolet radiation from the sun.
2. Carbon	e. the substances found in certain kinds of food (bread, potatoes) that provide you with energy.
3. Food chain	h. the structure where photosynthetic generation of ATP occurs in algae and plant

	cells.
4. Photosynthesis	a. a chemical substance that is found in living creatures which produces changes in other substances without being changed itself.
5. A leaf	f. a series of living things which are linked to each other because each thing feeds on the next to it in the series.
6. Ozone layer	i. a chloroplast having an additional complex internal membranous system.
7. Carbohydrates	c. a colourless gas that exists in large quantities in the air. All plants and animals need it.
8. A chloroplast	d. a process in which radiant (light) energy is absorbed by specialized pigments of a cell and is subsequently converted to chemical energy.
9. Thylakoid	g. the common chemical element that diamonds and coal are made up of.
10. An enzyme	j. a part of a tree or plants that is flat, thin, and green.

C. Make a summary of the text

Talking points

Discuss in small groups:

1. The great role of photosynthesis on the planet Earth.
2. The process of photosynthesis (the detailed description of it).
3. “Light” and “dark” reactions in photosynthesis.
4. The site of photosynthesis in plants.

Lesson VII

A New Concept of Vitamins

In this chapter, you will:

- learn about the most wide spread vitamins;
- identify the structure and classification of vitamins;
- discuss the various scientific approaches to vitamins;
- understand the origin of the term vitamin and the work done by the Polish-American biochemist Casimir Funk;
- make a general overview of vitamins;

Learn the following key terms and names:

carotene (β + n)	nutrition (n)
bowels (n)	maintenance (n)
coenzyme (n)	overdose (n)
fragility (n)	physician (n)
fats (n) – pl.	preventive (adj.)
hypothyroidism (n)	soluble (adj)
egg yolk (n+n)	supplement (n)
healing (n)	tissue (n)

Reading

A. Read the text once and answer the questions:

1. What term gave rise to the word vitamin?
2. What vitamins do you know? Can you comment upon their characteristic features?
3. Can you say a few words about vitamins acting as catalyst?
4. The vitamins differ in structure, don`t they?
5. In what way are vitamins classified?
6. What are the characteristics of vitamin A (retinol)?
7. What is the quality of life of those people who do not get the required amounts of vitamins? What is your opinion on the matter?

Vitamins are essential animal nutritional factors. The word vitamin was derived from the term "vitamine", used by Polish-American biochemist Casimir Funk to describe an amine (organic base) that was essential to life.

Like most people, we know we should take vitamins but what we rarely understand is why. Again, vitamins from natural sources are superior to the synthetic variety.

When it comes to fear of toxicity it is mainly the fat-soluble vitamins that need to be taken as directed. Vitamin A group is best not taken as a supplement as it can lead to complications. It is better to take it as natural beta-carotene which will be converted by the body to vitamin A.

Vitamin E can prove to be easily toxic and lead to complications if taken over a long period, hence vigilance is advised. It is better to get it from natural sources rather than supplements.

One can be cautious but there is no need to panic because it takes a lot of vitamins taken in excessive amounts over a long period of time to get overdosed. It is important to remember that vitaminosis is a very rare phenomenon.

Fat soluble vitamins can be stored by the body over very long periods without any adverse effects, and are safely released into the system as required by the body.

Further, there are some vitamins such as vitamin C which is virtually impossible to get an overdose of.

The reality is that more people do not get the required amount of vitamins and consequently lead a poor quality of life.

Vitamins are a group of organic substances that are required in the diet of humans and animals for normal growth, maintenance of life, and normal reproduction. Vitamins act as catalysts; very often, the vitamins themselves are coenzymes. Besides vitamins,

foods contain – carbohydrates, proteins, fats, minerals, and water – and other substances necessary for health.

The vitamins differ in structure, and there is no chemical grouping common to them all. A substance that functions as a vitamin for one species does not necessarily function as a vitamin for another species.

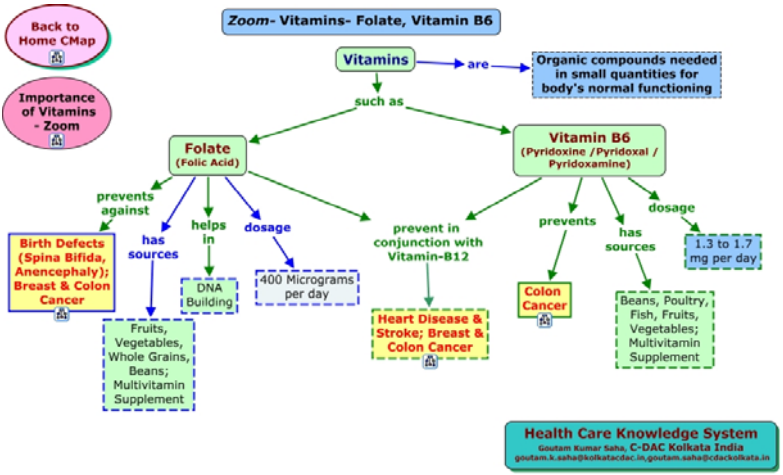
Although vitamins were previously seen only as preventives against the various deficiency diseases, more and more studies have examined additional health benefits of vitamins. Health claims that are unsubstantiated by scientific study, however, are regarded by many health and nutrition experts as fraudulent or dangerous, and many physicians now question the need for healthy persons to take multivitamin supplements, because many foods, such as milk and bread, are fortified with vitamins.

Vitamins were originally classified according to their solubility in water or fats, and as more and more were discovered they were also classified alphabetically.

The fat-soluble vitamins are A, D, E, and K; the B complex and C vitamins are water soluble.

A group of substances that decrease blood capillary fragility, called the vitamin P group, are no longer considered to be vitamins.

Vitamin A (retinol), a fat-soluble lipid, presents a broad class of organic products found in living systems. Most are insoluble in water but soluble in non-polar solvents. The definition excludes the mineral oils and other petroleum products obtained from fossil material.



It is either derived directly from animal foods such as liver, egg yolks, cream, whole milk, cheese or butter or is derived from beta-carotene, a pigment that occurs in leafy green vegetables and in yellow fruits and vegetables.

Vitamin A is essential to skeletal growth, normal reproductive function, and the health of the skin and mucous membranes. It also boosts immune function and promotes tissue healing. It is recommended for fighting infections, excessive menstrual bleeding, peptic ulcer, inflammatory bowel disease, acne, and hypothyroidism. It is involved with skin, immunity, resistance to

infection, antioxidant, cancer prevention and also involved with a host of body functions.

(Source: Christian Nordqvist. Vitamins: What are they and what do they do?
https://www.medicalnewstoday.com/articles/195878.php)

B. Read the text again. Mark the sentences T (true) or F (false). Correct the false ones.

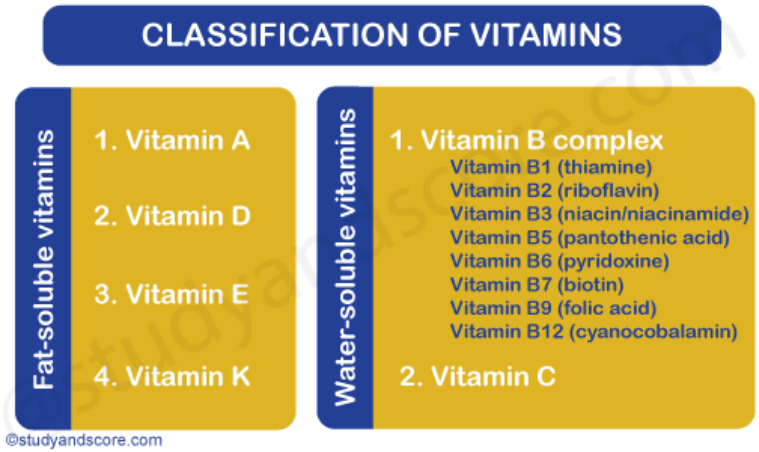
1. Vitamin A group is the best to take as a supplement as it can`t lead to complications.
2. It is better to get Vitamin E from natural sources rather than supplements.
3. You should remember that vitaminosis is a very common phenomenon.
4. Vitamins are group of organic substances that are required in the diet of humans and animals for normal growth, maintenance of life and normal reproduction.
5. There is a chemical grouping common to all the vitamins.
6. The vitamins A, D, E, K are water-soluble, the B complex and C vitamins are the fat-soluble vitamins.
7. Vitamin A is essential to skeletal growth, normal reproductive function, and the health of the skin and mucous membranes.
8. Nowadays, a group of substances that decrease blood capillary fragility, called the vitamin P group, is considered to be vitamins.

C. Make a summary of the text

Talking points

Discuss in small groups:

1. The modern structure and classification of vitamins.
2. The scientific points of view with regard to vitamins.
3. Recent studies of vitamins.
4. Vitamin A as an essential to life factor.



Lesson VIII

Pollen Contents of Honey

In this chapter, you will:

- learn about four natural resources required by honeybees for survival: water, resin, nectar and pollen;
- explain the significance of each of the above-mentioned natural resources for honeybees;
- determine the terms associated with the study of pollen in honey;
- present some statistics about honey bees and the production of honey;
- comment on the incorporation of pollen into honey;

Learn the following key terms and names:

anther (n)	maturity (n)
corbicula (n)	nectar (n)
evaporation (n)	larva (pl – ae) (n)
germination (n)	pollen (n)
hive (n)	resin (n)
honeycombs (n)	wax (n)
tibia (pl – ae) (n)	

Reading

A. Read the text once and answer the questions:

1. What are four natural resources required for honeybees` survival?
2. Can you comment on each component which honeybees need?
3. How many flowers must honeybees visit to make one pound of honey?
4. What does pollen include?
5. Why is a phytocidal acid added to the pollen?
6. What is the scientific name of the honeybee?

There are four natural resources required by honeybees for survival: water, resin, nectar, and pollen. Water is used to cool the hive and to dilute the honey fed to the larvae. Resin is utilized to reinforce the hive, seal off decaying wood, and plug up holes.

Nectar is the major source of carbohydrates from which honeybees obtain their energy. Nectar is collected by foraging worker bees and is carried back to the hive in their honey stomachs. Upon returning to their hive, the nectar is usually transferred to hive workers for processing into honey, although it can be fed directly to the brood or to the adults. Enzymes from the bee's hypo-pharyngeal glands are added to the nectar in the bee's crop. These enzymes break down the nectar into simple forms of sugars, which are easier for the bees to digest. These enzymes, in addition to the high sugar content, also protect the stored honey from bacteria. The water in the nectar is then evaporated off of the worker's tongue. The nectar is placed into cells and fanned to further reduce water in it. Through this process, the water content in the nectar is reduced to less than 18%. Once the evaporation process is complete, the nectar is considered "ripened" and is called honey. The cell is capped with wax until the honey is needed for feeding to the larvae or the adults.

Some statistics about honeybees and the production of honey are important to note. Years of observation and research have revealed a number of facets about this subject. For example, it is estimated that to make one pound of honey, honeybees must visit about two million flowers, fly a total of about 50,000 miles, and carry about 37,000 loads of nectar back to the hive.

According to the British entomologist, Arthur Thomson, during the main flower blooming periods it is common for the bees from a single hive to visit as many as 250,000 flowers during the course of a single day. Some flowers, such as the ones of a tulip tree (Liriodendron tulipifera), each produces about a teaspoon of nectar. Other flowers, such as the ones of white clover (Trifolium repens), produce only enough nectar to cover 1/20 of a pinhead.

Each worker bee is able to carry a load of nectar equal to one-half its total weight and during her lifetime one worker will collect enough nectar to produce about 1/12 of a teaspoon of honey. During nectar gathering, a honeybee consumes 0,5mg of ripe honey per kilometer of flight. To produce one liter of surplus honey the worker bees of a hive will consume eight additional liters of ripe honey as food. Ripened honey and pollen stored in a hive are the food sources eaten by the bees. Feeding a bee larva from the egg to maturity requires about 142 mg of honey.

Where does the pollen in honey come from?

Pollen is the bee's major source of proteins, fatty substances, minerals, and vitamins. It is essential growth of larvae and young adult bees. Honeybees remove pollen from an anther using their tongue and mandibles. While crawling over flowers, pollen adheres to their “hairy" legs and body. The honeybee combs pollen from her head, body, and forward appendages, mixes it with pollen from her mouth, and transfers it to the corbicula, or “pollen basket”, on her posterior pair of legs. When “loaded” with pollen, she will return to her hive. Once at the hive, workers pack

the pollen into the comb. To prevent bacterial growth and delay pollen germination, a phytocidal acid is added to the pollen comb, which is referred to as “bee bread” and is ready for later consumption by the bees.

Melissopalynology is the study of pollen in honey. For over 100 years the literature pertaining to the study of pollen in honey has been termed or spelled several ways, including: mellissopalynology, mellittopalynology, and melittopalynology. According to Paxton's Botanical Dictionary (1868), both "melissa" and "melitta" mean "a bee". The International Commission for Bee Research uses "mellissopalynology".

Pollen can be incorporated into the honey produced in a beehive in a number of ways. When a honeybee lands on a flower in search of nectar, some of the flower's pollen is dislodged and falls into the nectar that is sucked up by the bee and stored in her stomach. At the same time, other pollen grains often attach themselves to the hairs, legs, antenna, and even the eyes of visiting bees. Later, some of the pollen that was sucked into her stomach with the nectar will be regurgitated with the collected nectar and deposited into open comb cells of the hive. While still in the hive the same honeybee might groom her body in an effort to remove entangled pollen on her hairs. During that process pollen can fall into open comb cells or the pollen can fall onto areas of the hive where other bees may track it into regions of the hive where unripe honey is still exposed in open comb cells. Some worker bees also collect pollen for the hive. The smooth, slightly concave, outer surfaces of the hind tibia in worker bees are fringed with long hairs that curve over the tibia surface to form a hollow area. This hollow area is called the "pollen basket"

or orbicular. The worker bees collect pollen with their front and middle legs and then deposit it in their cubicula. In the process of depositing collected pollen in special comb cells, some of it can fall into the hive or into open honeycombs. It is also noted that occasionally worker bees might add pollen to the nectar they are transforming into honey.

(Source: Pollen. – URL: https://en.wikipedia.org/wiki/Pollen)

B. Read the text again. Match the beginnings of each sentence with the endings:

1. Resin is utilized to reinforce the hive…	d) and fanned to further reduce water in it.
2. Some flowers, such as the ones of a tulip tree (Liriodendron tulipifera)…	c) water, resin, nectar and pollen.
3. The nectar is placed into cells…	g) proteins, fatty substances, minerals and vitamins.
4. There are four natural resources required for honeybee's survival:	b) seal off decaying wood, and plug up holes
5. The worker bees collect pollen with their front and middle legs	e) each produces about a teaspoon of nectar.
6. During nectar gathering, …	a) and then deposit it in their corbicular
7. Pollen is the bee's major source of…	f) a honey bee consumes 0.5mg of ripe honey per kilometer as food

C. Make a summary of the text

Talking points:

Discuss in small groups:

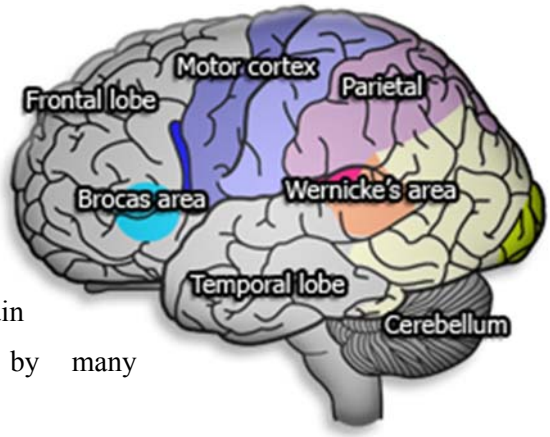
1) Four natural resources required by honeybees for survival: water, resin, nectar and pollen.
2) Some statistics about honeybees and the production of honey.
3) Pollen as the major source of proteins, fatty substances, minerals and vitamins.
4) The science dealing with the study of pollen in honey.

Table 1. Pollen types in honey samples.

Honey Type	Principal Pollen Type (min.%–max.%)
Raspberry	*Rubus idaeus* (49.1–82.3%)
Rape	*Brassica* spp. (50.1–71.1%)
Sunflower	*Helianthus* spp. (46.5–92.1%)
Mint	*Mentha* spp. (46.5–65.1%)
Thyme	*Thymus* spp. (22–45%)

Lesson IX

Brain Maps



In this chapter you will:

- learn about studies of brain maps made by many scientists;
- determine the terms associated with brain maps;
- compare the results of the early and later brain map models;
- examine the peculiarities of the self-organizing map (SOM) as an automatic data-analysis method;
- evaluate the cognitive possibilities and potentialities of the human brain;

Learn the following terms and names:

artificial (n)	neural (adj)
cognitive (adj)	network (n)
feature (v, n)	node (n)
function (v, n)	sensory (adj)
link (n)	stimulus (stimuli) –n
modify (v)	mediate (v)
modifiability (n)	

Reading

A. Read the text and answer the questions:

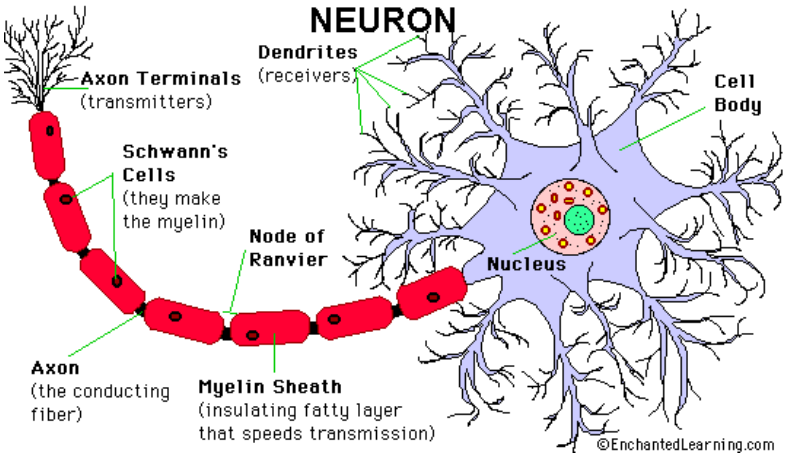
1. What systems of cells are called brain maps?
2. What do the fine structures and feature scales depend on?
3. How were feature sensitive cells formed?
4. Were the early, biologically inspired brain map models suitable for practical data analysis?
5. What is the neural connectivity responsible for?
6. What cognitive functions does the human brain perform?

The self-organizing map (SOM) is an automatic data-analysis method. It is widely applied to clustering problems and data exploration in industry, finance, natural sciences, and linguistics. The most extensive applications, exemplified in this paper, can be found in the management of massive textual databases and in bioinformatics. The SOM is related to the classical vector quantization (VQ), which is used extensively in digital signal processing and transmission. Like in VQ, the SOM represents a distribution of input data items using a finite set of models. In the SOM, however, these models are automatically associated with the nodes of a regular (usually two-dimensional) grid in an orderly fashion such that more similar models become automatically associated with nodes that are adjacent in the grid, whereas less similar models are situated farther away from each other in the grid. This organization, a kind of similarity diagram

of the models, makes it possible to obtain an insight into the topographic relationships of data, especially of high-dimensional data items. If the data items belong to certain predetermined classes, the models (and the nodes) can be calibrated according to these classes. An unknown input item is then classified according to that node, the model of which is most similar with it in some metric used in the construction of the SOM. A new finding introduced in this paper is that an input item can even more accurately be represented by a linear mixture of a few best-matching models. This becomes possible by a least-squares fitting procedure where the coefficients in the linear mixture of models are constrained to nonnegative values.

It has been known for over hundred years that various cortical areas of the brain are specialized to different modalities of cognitive functions. However, it was not until, e.g., Mountcastle as well as Hubel and Wiesel found that certain single neural cells in the brain respond selectively to some specific sensory stimuli. These cells often form local assemblies, in which their topographic location corresponds to some feature value of a specific stimulus in an orderly fashion. Such systems of cells are called brain maps.

It was believed first that the brain maps are determined genetically, like the other



bodily formations and organizations. Many of these maps, at least their fine structures and feature scales were found to depend on sensory experiences and other occurrences. Studies of brain maps that are strongly modified by experiences have been reported especially by Merzenich et al. Among some theoretical biologists in the 1970s, e.g. Grossberg, Nass and Cooper, and Perez, Glass, and Shlaer, the question arose whether feature-sensitive cells could be formed also in artificial systems automatically, by learning (i.e., adaptation to simulated sensory stimuli).

However, already Malsburg, and later Amari demonstrated that their topographic order may also ensue from the input data. The above modeling approaches deserve to be mentioned among the first successful theoretical proofs of input-driven self-organization. In them, the emergence of feature-sensitive cells

was implemented by the so-called competitively learning neural networks. In a subset of cells, adaptation of the strongest-activated cells to the input signals made them become tuned to specific input features or their combinations.

The early, biologically inspired brain map models, however, were not suitable for practical data analysis. One of their inherent handicaps was that the resulting maps were partitioned. They were made up of small patches, between which the ordering jumped discontinuously and at random, and thus no global order over the whole map array was achieved. Although such partial ordering is commonplace in biology, many brain maps that represent abstract features, such as the tonotopic maps, the color maps, and the sonar-echo maps as reported in Suga and O'Neill, Tunturi, and Zeki respectively, are globally organized. Neither did these models scale up, i.e., they could not be used for large networks and high signal dimensionalities, in spite of highly increased computing power.

It is possible to state in retrospection that from the early neural models of self-organization there was an important factor missing. It is a control factor or function, the amount of which depends on local signal activity, but which itself does not contribute to the signals. Its only purpose is to control the plasticity (modifiability by the signals) of selected subsets of neural connections in the network. So, in the neural models, it

will not be enough to control the activities of the nodes by the activities of other nodes through the links, i.e., the neural connections. One needs extra kinds of control factors that mediate information without mediating the activities. It is generally known that such information is carried in the neural realms by, e.g., the chemical messenger molecules.

On the other hand, if the above neural and chemical functions are taken into account at least in abstract form, it is possible to scale up the self-organizing systems up to the capacity limits of the modern computers.

(Source: Teuvo Kohonen. Essentials of the self-organizing map - Cross Section // Neutral Networks, 37 (2013). - P. 52-65)

B. Match the word with their definitions:

1. A stimulus	**d.** relating to a nerve or to the nervous system.
2. The brain	**b.** a point, especially in the form of lump or swelling, where one thing joins another.
3. An analysis	**e.** something that is sent to provide a piece of information.
4. A feature	**i.** an electronic machine that can quickly make calculations, store, rearrange, retrieve information or control another machine.

5. Neural	**c.** the scientific process of examining something in order to find out what it consists of.
6. A node	**a.** an interesting or important part or characteristic of something.
7. A messenger	**g.** something that encourages activity in people and things.
8. A computer	**h.** the organ inside our head that controls our body activities and enables us to think and feel things.

C. Make a summary of the text

Talking points

Discuss in small groups:

1. The brain and its cognitive functions.
2. The role of brain maps in the process of examining and learning.
3. The brain as a center of the nervous system.

Lesson X

Biology of Fishes

In this chapter, you will:

- learn about most of the great lakes of the world which have developed numbers of closely related endemic species;
- determine the terms associated with various kinds of fishes and species flocks;
- compare the information about the great lakes of the world mentioned in the text;
- comment on the cases of great varieties and diversification of fishes developed in the process of evolution;
- evaluate the fact that the deeper dwelling species of Lake Baikal in Siberia show amazing parallels with many deep-dwelling marine fishes.

Learn the following key terms and names:

adapt (v)	morphology (n)
adaptation (n)	nesting (n)

ancestor (n)	oxygenate (v)
endemic (adj)	oxygenation (n)
fauna (n)	reproduce (v)
flock (n)	reproduction (n)
invertebrates (n) – pl	variable (n)
isolation (n)	variety (n)
morphotype (n)	

Reading

A. Read the text once and answer the questions:

1.What great lakes of the world have developed numbers of closely related endemic species?

2.What are the so called "species flocks"?

3.Do these species flocks typically show great diversification of morphological adaptations?

4.How many families and species of the fish fauna does Lake Baikal in Siberia include?

5. How and when did fishes (or their ancestors) arrive in each habitat in the world?

6. How did fishes meet the many physiological challenges presented by extremes of temperature, salinity, alkalinity and other environmental variables?

7. What does the student of fishes deal with?

Most of the great lakes of the world, the Laurentian Great Lakes of North America, Lake Baikal, the Rift lakes of Africa, and Lake Titicaca in the Andes, as well as many smaller lakes such as Lake Lanao in the Philippines or the Laguna Chichicanarab in Mexico have developed numbers of closely related endemic species (those that occur nowhere else in the world) that are referred to as species flocks and are believed to have evolved from only a few ancestral forms that were present in the lake when it was first formed. Large species flocks may occur in larger lakes such as Lake Victoria where it appears that hundreds of species (many becoming extinct before they are even discovered or described) have evolved from a few ancestral forms. But after only a few thousand years of isolation, smaller lakes can develop their own distinctive fish faunas, often rich in endemic species. These species flocks typically show great diversification of morphological adaptations, often associated with feeding or reproduction, that permit the occupation of a wide variety of ecological niches very different from the ancestral type. The small Mexican lake, Cuatro Cienegas provides an example of what may

be a best case of a species flock in the process of evolution. The lakes sole native cichlid species (Herichthys minckleyi) exhibits at least three distinct morphotypes, each characterized by body form and tooth morphology as well as distinct feeding preferences. All morphotypes can occur in a single nesting and the eventual development of teeth and food habits depends partly on genetics and partly on food availability during the fish's development.

Lake Baikal in Siberia is the world's largest (by volume) and deepest lake. Its fish fauna consists of only about 50 species classified into 12 families. But three of these families (Cottidae, Abyssocotidae, and Cemephoridae) containing 23 species are varieties of sculpin. The Lake Baikal cottoids show distinct depth distributions. Unlike many deep lakes, Baikal's waters are well

oxygenated throughout, allowing fishes and invertebrates to occupy habitats down to the maximum depth of the lake, just over 1600 m. Although the shallow water species are similar in many ways to shallow-water fishes found in other nearby habitats, the

deeper dwelling species of Lake Baikal show amazing parallels with many deep-dwelling marine fishes having reduced musculoskeletal and respiratory systems, oil based buoyancy systems, and eyes adapted for vision in their low-intensity light environments. It seems all that is missing in Lake Baikal fishes are bioluminescent organs to make the comparison complete!

Fishes come in a great variety of different species and

successfully occupy almost every habitat on earth that contains liquid water. How and when they (or their ancestors) arrived in each habitat, how they meet the many physiological challenges presented by extremes of temperature, salinity, alkalinity, and other environmental variables, and how similar morphological, physiological, and biochemical adaptations have evolved in

discrete phylogenetic lineages afford a variety of challenges and intellectually rewarding experiences for the student of fishes.

(Source: Quentin Bone, Richard Moore. Biology of Fishes. Eastbourne, UK: Gardners Books, 2008. – P. 57-58.)

B. Read the text again. Put the following sentences in the correct order:

1. The small Mexican lake Cuatro Ciénegas provides an example of what may be a best case of a species flock in the process of evolution.

2. Large species flock may occur in larger lakes such as Lake Victoria, where it appears that hundreds of species have evolved from a few ancestral forms.

3. Fishes come in a great variety of different species and successfully occupy almost every habitat on earth that contains liquid water.

4. Lake Baikal in Siberia is the world's largest(by volume) and deepest lake.

5. All morphotypes can occur in a single nesting and the eventual development of teeth and food habits depends partly on genetics and partly on food availability during the fish's development.

6. Fish fauna of Lake Baikal consists of only about 50 species classified into 12 families.

7. Unlike many deep lakes, Baikal`s waters are well oxygenated throughout allowing fishes and invertebrates to occupy habitats about to the maximum depth of the lake, just over 1600 m.

C. Make a summary of the text.

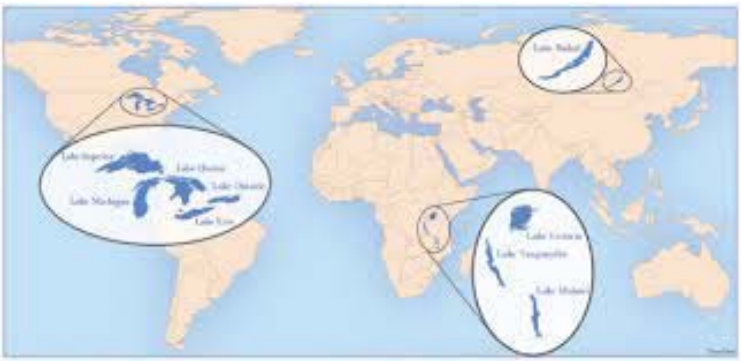
Talking points

Discuss in small groups:

1. The great lakes of the world and their peculiar features.

2. Siberia`s Lake Baikal as a living laboratory.

3. The original fauna of Lake Baikal.



Part II

GRAMMAR TESTS

Test № 1 The Cell and Cell Theory

Put the correct prepositions in the following sentences:

All organisms are composed ___ (1) structural and functional units ___ (2) life called cells. The body ___ (3) some organisms like bacteria, protozoa and some algae is made __ ___(4) a single cell, while the body ___ (5) fungi, plants and animals is comprised ___(6) many cells. A human body consists ___ (7) about one trillion cells.

Cells vary___ (8) size and structure as they are specialized to perform different functions, but the basic components ___ (9) the cell are common ___ (10) all cells. After Anton van Leewenhock had invented the microscope, Robert Hooke ___ (11) 1665 observed a piece of cork (12) the microscope and found it to be made _ _(13) compartments which he called “cells”. ___ (14) 1672, Leewenhock saw and noticed bacteria and red blood corpuscles all ___ (15) which were cells. ___ (16) 1831, Robert Brown, an Englishman, stated that all cells had a centrally positioned body which he termed the nucleus.

___ (17) 1838, M.J. Schleden and Theodore Schwann formulated the “cell theory”. The cell theory maintains that all organisms are composed ___ (18) cells, the cell is the structural and functional unit ___ (19) life. Besides, cells arise ___ (20) pre-existing cells.

The cells vary considerably ___ (21) shape and size. Nerve cells ___ (22) animals have long extensions. They can be several feet ___ (23) length. Some plant cells have thick walls. There is also a wide variation ___ (24) the number ___ (25) cells ___ (26) different organisms. A cell may be defined as a unit ___ (27) protoplasm bounded ___ (28) a plasma or cell membrane and possessing a nucleus. Protoplasm is the life-giving substance including the cytoplasm and the nucleus. The cytoplasm comprises organelles such as ribosomes, mitochondria, Golgi body, plastids, lysosomes and endoplasmic reticulum. Plant cells have ___ (29) their cytoplasm large vacuoles containing non-living inclusions like crystals, pigments, etc. There are two main types ___ 30) cell. They are devided ___ (31) prokaryotic cells and eukaryotic cells. It should be noted that cells are the “atoms” ___ (32) biology. Every question ___ (33) biology ___ (34) ecology ___ (35) evolution must be answered partly ___ (36) the level ___ (37) the cell. Thus, understanding the cell is the key ___ (38) understanding Biology.

Test № 2 Class Mammalia – The Mammals

Put each of the following words or phrases in its place in the passage below.

feed	glands	placental
deserts	human beings	distinguish
injury	four-chambered	pursue
egg-laying	the young	species
secretion	habitats	highly-differentiated
environment	carnivorous	origin
incisors	warm-blooded	diverse
vertebrates	subclasses	birth

Mammalia is a class of ____ (1) containing some 4250 species. Mammals are animals which ____ (2) their babies with milk produced by their mammary ____ (3). Mammals are ____ animals, typically having sweat glands whose ____ (4) cools the skin and an insulating body covering of hair. Mammalia is a word of Latin ____ (5). The world of mammals is ____ (6). Dogs, cows, dolphins, wolves, mice, bats and ____ (7) are all mammals. They may be found and seen in different ____ (8): on the ground, including forests, mountains, fields, ____ (9), in ocean or seawaters or even in the air. Mammalian teeth are

differentiated into ____ (10), canines, premolars and the molars and the middle ear contains three sound-conducting ear ossicles. These, together with well-developed sense organs and brain, have enabled mammals to ____ (11) and active life and to colonize a wide variety of ____ (12). Mammals evolved from ____ (13) reptiles in the Triassic period about 225 million years ago.

Mammals have several characteristics that ____ (14) them from other classes of animals:

- Mammals have mammary glands that secrete milk for __ (15).
- The body covering of mammals is mainly hair or fur which protects their body from ____ (16) and fluctuations of temperature.
- Like birds, mammals are warm-blooded and have a ____ (17) heart. In addition, they have a complex nervous system.
- Except for a few (18) ____ mammals, mammals give birth to the young which are born after developing inside the mother.
- Mammals have four types of well-developed teeth that are ____ (19), i.e. perform different functions and tasks.
- Most of the mammals have fewer babies at each ____ (20) than many other classes of animals.
- Biologists classify the 4250 ____ (21) of mammals alive today into 18 orders. There are three ____ (22) of mammals: egg-laying mammals, marsupials and ____ (23) mammals.

Test № 3

General Chemistry of the Cell

Read the text and decide which option a, b or c best fits for each space:

All the substances present in protoplasm fall into two great classes: inorganic and organic substances. Inorganic substances make up the bulk of living as well as non-living matter.

In living matter inorganic components are very _____ (1). This is due to _____ (2) the high proportion of water in all protoplasm.

Water _____ (3) in many metabolic reactions in all cells. Nitrogen (N_2), Oxygen (O_2), Carbon dioxide (CO_2) are present in the cell and take part in many metabolic reactions.

Organic compounds _____ (4) only in living bodies, their products or in _____ (5). It is well–known that organic chemistry is the chemistry of carbon _____ (6). These organic compounds are divided into three main classes: _____ (7), the lipids and the proteins.

The most familiar carbohydrate compounds are sugars, _____ (8) glycogens, and cellulose. All carbohydrates _____ (9) carbon, hydrogen and_____ (10).

Lipids are important _____ (11) of cell organelles, especially of the cell membrane, mitochondria, microsomes, chromosomes, nucleolus and possibly of the nuclear membrane. The fats in the protoplasm serve mainly as _____ (12) fuels.

Proteins are all-important structural components in every cell. Proteins _____ (13) carbon, hydrogen, oxygen, nitrogen and _____ (14). Chemically, proteins are the most _____ (15) of cell substances. The nucleic acids are also very long chained molecules.

In addition to the proteins, carbohydrates, lipids and other _____ (16) mentioned substances, protoplasm always contains smaller _____ (17) of other, usually simpler, organic compounds.

1	A fretful	B frequent	C frigid
2	A mainly	B manly	C largely
3	A participates	B reacts	C selects
4	A omit	B offer	C occur
5	A remains	B remarks	C relations
6	A composites	B compounds	C comports

7	A carbonadoes	B carbohydrates	C carbonates
8	A starches	B statures	C stators
9	A include	B collect	C connect
10	A sodium	B oxygen	C potassium
11	A consistencies	B constituents	C constituencies
12	A accessory	B acceptable	C accentual
13	A contend	B contain	C maintain
14	A calcium	B fluorine	C sulphur
15	A complimentary	B complementary	C complicated
16	A probably	B presumably	C previously
17	A amounts	B accessories	C accounts

Test № 4 E-Mail Versus Snail Mail

Read the text and decide which option a, b, c or d best fits for each space:

Modern technology has brought about enormous improvements in communications and yet many people are still very worried _____ (1) using the latest computer technology. I am often _____ (2) to meet colleagues who still don`t know what the `e` one mail stands for and they are too _____ (3) to ask. They assume you have to be skilled _____ (4) computers to send a message via email but in fact it is _____ (5) thing in the world. It is also _____ (6) to send an email message _____ (7) to send an ordinary letter or a `snail` message which also takes _____ (8) longer. An email message is only _____ (9) more expensive than a local telephone call to send; on top of the call itself you also have to pay fee to your `server`. If you send a letter by _____ (10) mail it will take a couple of days to get there whereas an email will not take_____ (11) than a few seconds. Once you become _____ (12) to using the system you will be _____ (13) at how much more _____ (14) it is than other means of communication. Of course, before you have access to email, you will need a fairly _____ (15) computer, which can be quite expensive.

1	a) for	b) about	c) at	d) with us
2	a) surprising	b) irritating	c) surprised	d) irritated
3	a)embarrassing	b) embarrassed	c) tired	d) tiring
4	a) about	b) into	c) to	d)in
5	a) simplest	b) the more simple	c) simpler	d) the simplest
6	a) cheaper	b) more cheaper	c) the cheapest	d) the cheaper
7	a) as	b) than	c) that	d) from
8	a) much	b) more	c) as	d) lot
9	a) little	b) slightly	c) less	d) least
10	a) second hand	b) low paid	c) part time	d)first class
11	a) more long	b) longest	c) as long	d) longer
12	a) capable	b) accustomed	c) clever	d) good
13	a) amazed	b) puzzled	c)experienced	d) pleased
14	a) confident	b) certain	c) efficient	d) skillful
15	a) strong	b)great	c) powerful	d) large

Test №5 Genetics

Read the text and fill in the verbs in brackets in the correct tense forms:

In view of an enormous variety of life, even animals and plants that _____ (**be**) alike _____ (**have**) many differences. Genetics _____ (**deal with**) differences between members of a species. Genetics _____ (**study**) the factors which _____ (**be**) responsible for variations in individual organisms and ways of predicting these variations. Thus, genetics _____ (**explore**) many problems concerning the hereditary mechanisms.

Modern genetics _____ (begin) to develop very rapidly in the second decade of the 20th century though the foundation of it _____ (**lay**) by Gregor Mendel between 1857 and 1865. Since then genetics in all parts of the world _____ (**cooperate**) in establishing the chromosome theory of heredity. Nowadays there _____ (**exist**) a great amount of experimental evidence on chromosomes and genes. Genetic experiments _____ (**presuppose**) a very accurate knowledge of the stocks that should be crossed. Modern genetics _____ (**owe**) a great deal to Drosophila melanogaster commonly called the fruit fly. At the age of twelve days these little flies _____ (**begin**) to breed. It should be noted that within three years it _____ (**be**) possible to study more than 60 generations of Drosophila. Experiments on Drosophila melanogaster _____ (**pioneer**) practically all

advances in modern genetics. However, the laws of heredity, as worked out in Drosophila and other lower forms, _____ (**prove**) to be generally applicable to man and all other higher organisms.

Modern genetics _____ (**contribute**) much to artificial selection. Artificial selection _____ (**produce**) many "breeds" of animals and plants according to man`s needs or fancy attempts to improve the quality of domesticated animals and plants. Attempts to improve the quality of domesticated animals and plants _____ (**start**) long before the laws of heredity were understood. Thus, breeding _____ (**deal with**) raising a certain type of animal or plant by crossing one variety with another to produce a new variety where the characteristics which the breeder _____ (**want**) to keep _____ (**be**) the strongest ones. However, modern genetics _____ (**accelerate**) the processes of selective breeding, because modern breeders _____ (**select**) their crosses logically and efficiently, according to the laws of segregation, assortment, linkage, etc.

It should be noted that the breed _____ (**be**) a domesticated variety of an animal or, rarely, a cultivated variety of a plant. Examples of animal breeds _____ (**be**) Friesian cattle and Shetland sheepdogs.

Test № 6

The Human Brain

Read the text. Put the verb in brackets into the correct form (active or passive):

The brain 1 (**be**) the enlarged anterior part of the vertebrate nervous system, which 2 (**encase**) within the cranium of the skull. Continuous with the spinal cord, the brain 3 (**surround**) by three membranes and 4 (**bathe**) in cerebrospinal fluid, which 5 (**fill**) internal cavities. The brain 6 (**function**) as the main coordinating centre for nervous activity.

It 7 (**receive**) information in the form of nerve impulses from sense organs, 8 (**interpret**) it, and 9 (**transmit**) instructions to muscles and other effectors.

The latter 10 (**produce**) a physiological response when stimulated by a nerve impulse. It should be emphasized that the brain 11 (**be**) also the seat of intelligence and memory. The embryonic vertebrate brain 12 (**include**) three sections (forebrain, hindbrain, midbrain), which 13 (**become**) further differentiated during the development into specialized regions. The main parts of the adult human brain 14 (**be**) a highly developed cerebrum in the form of two cerebral hemispheres and hypothalamus. It is widely known that the hypothalamus 15 (**regulate**) a wide variety of physiological processes, including maintenance of body

temperature, water balance, sleeping and feeding via both the autonomic nervous system which it 16 (**control**) and the neuroendocrine system as well.

It is interesting to note that brain death 17 (**occur**) when the permanent absence of vital functions of the brain 18 (**observe**), which 19 (**mark**) the cessations of breathing and other reflexes including the pupillary reflex controlled by the brainstem and by a zero reading on an electroencephalogram. Organs 20 (**may/remove**) for transplantation when brain death 21(**establish**), which 22 (**may**/**not**/**necessarily**/ **associate**) with permanent absence of heart beat. The human brain 23 (**regard**) as the most complex biochemical mechanism created by Nature. It 24 (**have**) a great potential which never 25 (**reveal**) completely. The brain of a modern man 26 (**be**) the product of the long-term evolution of life on the Earth.

Test № 7

Match the terms with their definitions:

1. Vector	A: An organic compound from which proteins are made
2. Recombinant DNA (research)	B: A segment of DNA molecule that acts a kind of code for the production of some specific protein.
3. Amino acid	C: The application of genetic engineering technology for the cure of genetic disorders.
4.DNA (deoxyribonucleic acid)	D: Large molecules that are essential to the structure functioning of all living cells.
5. Protein	E: A large, complex chemical compound that makes the core of chromosomes and whose segments consist of genes.
6. Gene	F: A circular form of DNA often used as a vector in Genetic engineering.
7. Gene splicing	G: A set of nitrogen base combinations that act as a code for the production of

	certain amino acids.
8. Genetic code	H: The cell into which a new gene is transplanted in genetic engineering
9. Plasmid	I: An organic compound consisting of carbon, hydrogen, oxygen and nitrogen arranged in a ring that plays an essential role in the structure of DNA molecules.
10. Host cell	J: The process by which genes are cut apart and put together to provide them with some new information.
11. Human gene therapy (HGT)	K: Organism or chemical used to transport a gene into a new host cell.
12. Nitrogen base	L: Genetic engineering; a technique for adding new instructions to the DNA of a host cell by combining genes from two different sources.

Test № 8 Subject-Verb Agreement

Choose the correct form of the verb:

1. Bacteria (**has, have**) flourished on the Earth for millions of years.
2. Neither of possible ways (**is, are**) to make an experiment successfully.
3. Activity as well as cell structure (**is, are**) an essential condition of life.
4. A pack of wild dogs (**has, have**) frightened all the ducks away.
5. The majority (**believe, believes**) him to be a smart student.
6. Fifty minutes (**isn`t, aren`t**) enough time to complete the test.
7. Heart disease (**is not, are not**) one but many diseases. Nor (is, are) the heart alone involved.
8. Genetics (**is, are**) the branch of Biology concerned with the study of heredity and variation. Classical genetics (**is, are**) based on the work of Gregor Mendel.
9. Cattle (**is, are**) large four-legged farm animals especially cows, kept for their meat and milk.
10. Mycorrhizae (**is, are**) important associations between fungi and plant roots.

11. We know that it (**is, are**) University students who (**are, is**) engaged in various kinds of extracurricular activities.

12. There (**was, were**) nothing to attract our attention at that time.

13. A lot of knowledge (**is, are**) needed to be an expert in this field of science.

14. It should be noted that about 10 percent of the forest (**is, are**) cut down every year.

15. It is with these universal truths that this biological science begins.

16. The red and the white rose (**is, are**) both beautiful.

Test № 9

The Biology Laboratory

Read the text and choose the appropriate modal verb:

The laboratory work in biology (**can/should**) be an exciting or boring part of the course depending upon your attitude to it. If you regard it as an obstacle to your getting through the course, you won't enjoy it and get very little benefit from it. On the other hand, if you (**can/may**) approach laboratory work with the thought that it is an opportunity to learn and with a desire to make the most out of it, then it is almost certain you will find the time you spend on it profitable, interesting, and even fun.

There are several ways in which you (**ought to/ may**) expect to benefit from the laboratory work. It helps you to understand and remember the material you have studied by applying it to real cases. The hands-on approach (**need/can**) give both a real sense of biological concept and some skills in the use of scientific instruments and techniques. Lab sessions also give you a chance to get hands-on experience of techniques you have learnt about in lectures.

The facilities of the Biology Institute exist with considerable modernization. The experiments have been under way to determine and obtain very important research data. Anyway, in the laboratory you (**can/are to**) experience the thrill of discovering for yourself main processes and mechanisms of life. With the modern equipment in front of you, you have the chance to try out your own ideas, reason about the results, and draw conclusions from them. In brief, you (**could/should**) regard the laboratory as a place for intellectual exploration. Before you come to the laboratory, study the laboratory manual so that you will know what you (**can/should**) plan in advance, how to use your time and equipment efficiently.

As you perform the experiment, make an effort to correlate the behavior of the apparatus or specimen investigated with the material discussed in the lectures. You (**can/may**) pay special attention to the lab safety rules, preparing solvents and specimens of investigated tests and experiments.

A student (**must/can**) realize that laboratory work has applications outside the laboratory. For instance, laboratory tests on microbial processes show that they (**should/can**) be managed effectively to enhance the degradation of harmful pollutants, produce valuable products from waste. The experiments on genome sequencing allow us to produce better vaccines, diagnose diseases more quickly and develop treatment against cancer and Alzheimer's disease.

Writing laboratory reports is a significant part of your professional training. Speaking and writing are the most important tools of the experimentalists. Your laboratory report (**can/should**) be well–organized, accurate, clear, concise, and easy to read. It (**must/should**) be noted that the ability to express oneself clearly is extremely important for the professional person, a good researcher. Many scientific papers and reports result from the research accomplished in the biology laboratory and a notable number of papers which have already come out. We learn new facts by trying out new things and continue to ask questions outside the classroom. When doing lab work, students` initiative (**should/has to**) be encouraged.

Test № 10 The Blood

Read the text and fill in the correct form of the Infinitive:

Blood is known (**to be, to have been**) the red fluid that circulates through the body by way of the blood vessels. It is a very complex substance. (**To learn about, Learn about**) this substance is important for everyone. We know blood (**to circulate, to have circulating**) by means of contractions of the heart. The adult human body contains between 5 and 6 quarts of blood accounting for about 5% of the body weight. Death is considered (**to occur, to have occurred**) if about one third of the blood is lost. Blood in the arteries is known (**be, to be**) bright red in colour; blood in the veins is thought (to have been, to be) much darker, sometimes brownish red. It should be noted that blood consists of a liquid (blood plasma) containing blood cells. They are considered (**to include, to be included**) red and white blood cells, blood platelets, and blood plasma. The plasma is the liquid part of the blood, sometimes over 90% water. Essential elements that have (**to carry, to be carried**) from one place to another are dissolved in it. These elements are considered (**to include, to be included**) organic constituents such as blood sugar (glucose) and urea; inorganic elements such as sodium and calcium; gases such as oxygen and carbon dioxide; and secretions from the endocrine glands (hormones), antibodies, enzymes, and plasma proteins. In addition, we should know blood (**to be carried, to carry**) hormones and also (**to be acting, to act**)

as a defense system. The plasma proteins are believed (**to be making up, to make up**) about 7-8% of the plasma. (**To break down, To be broken down**) proteins into various fractions electrical methods were developed during and after World War II. Gamma globulin is known (**to have been, to be**) the fraction which contains antibodies against several diseases, notably measles and polio. Immunoglobulin is produced by certain white blood cells (lymphocytes) in response to entry into the body of a foreign substance antigen (**in order to render, to have been rendering**) it harmless. It also should be emphasized that blood makes it possible (**to transfer, transfer**) oxygen and carbon dioxide between the lungs and the body cells. Blood groups are thought (**to classify, to be classified**) according to the presence or absence of certain antigenic proteins (agglutinogens) on the surface of the red blood cells. We know blood of one group (**to contain, contain**) antibodies in the serum that react against the agglutinogens on the cells of other groups. Scientists consider incompatibility between the groups (**to result in, to have been resulting in**) clumping of cells (agglutination). It is important (**to know, to be known**) blood groups for blood transfusions. In humans, the two most important blood group systems are considered (**to have been, to be**) the ABO system and the system involving the rhesus factor. It should be noted that there exist A, B, AB, O groups. People of blood group O are described as “universal donors” as they can give blood to these of any of the other groups.

Test № 11 Grammar Tenses

Put the verb in brackets into the correct form:

1. The dentist advised his patient _____(**stop**) eating sweets.
2. While _____(**live**) in the soil, fungi build up their mycelium from the proteins and carbohydrates of the plant residues.
3. Many of the methods for _____(**culture**) bacteria were developed in the late nineteenth century in Germany by Robert Koch and his assistants.
4. I would like _____(**participate**) in the international conference devoted to the most important issues of modern biology.
5. Some bacteria grow elsewhere in the body and interfere with certain nervous system functions by _____(**produce**) neurotoxins which sooner or later will cause disease.
6. Two special cases are worth _____(**highlight**) to arrive at a certain conclusion.
7. There are a lot of plant species in the Botanical garden _____(**range**) from ferns, and tropical plants to hardy species of trees, shrubs and herbs of the Siberian flora.

8. _____(**Live**) organisms use the energy released from oxidation-reduction reactions for growth, reproduction, and other life processes such as movement.

9. _____(**Fight**) among animals of the same species serves the important function of "spacing out" the individuals or groups in the area they occupy.

10. Instead of _____(**pursue**) the above-mentioned topics in more detail we turn to other possible points.

11. Vitamins, which function in _____(**activate**) enzymes, are organic molecules of varied structure that are synthesized in the membranes and cytoplasm of cells.

12. They looked forward to _____(**see**) us in order to complete the experiment which had started before.

13. Eastern white pine wood contains less resin than that of other species and was extensively used for crates, boxes, match-sticks, furniture, _____(**floor**), and _____(**panel**).

14. Enzymes act as catalysts to many of the chemical changes _____(**occur**) in the _____(**live**) protoplasm.

15. Sam enjoys _____(**read**) about all kinds of fish because in the future he is going to become an ichthyologist.

16. The environmental factors _____(**play**) the greatest roles in _____(**determine**) the distributions of plant species in an ecosystem include precipitation, temperature, soils, and biotic factors.

17. This means that the subject of the study must be diverse, _____(**make**) it possible to explore completely new fields.

18. Differences in relation to the position of the cells in the embryo and differences in the cytoplasmic composition begin _____ (**appear**), and these small differences seem _____(**play**) a crucial role in cellular differentiation.

19. In 1885, Pasteur announced to the French Academy of Sciences that he had developed a vaccine for _____ (**prevent**) another dread disease, the rabies.

20. Besides _____ (**have**) mechanisms for _____ (**store**) genetic information, cells must have a means of _____(**obtain**) energy _____ (**carry out**) life functions.

Test № 12 Confusingly Related Words

Choose the correct word from the brackets:

1. The daring rescue in the forest of two members of a plant collection expedition seemed (**creditable / credible**).
2. His father is a great believer in (**alternate / alternative**) medicine – especially homeopathy.
3. Do you enjoy (**urban / urbane**) life, or would you prefer to live in the country?
4. This is a clever (**device / devise**) for cleaning fish without getting pinched by the scales.
5. This is (**hard / hardly**) the time for making an experiment in the laboratory.
6. This old man has had a (**hardly / hard**) life and this remarkable book has been a comfort to him.
7. The nurse took a (**sample / example**) of the boy`s blood for tests.
8. The doctor told him to use the (**liniment / lineament**) twice daily.
9. He was a man of (**sanguine / sanguinary**) temperament.
10. His brother is (**credible / credulous**) enough to believe everything you tell him.

11. There was an (**appreciative / appreciable**) drop in temperature last night.

12. Are these mushrooms (**eatable / edible**)?

13. The majority of tinned food is (**deficient /defective**) in vitamins.

14. There are very (**strict / severe**) laws in this country with regard to drinking and driving.

15. The word (**humane / human**) shows kindness and the qualities of a civilized person with regard to other people.

16. The caffeine in tea and coffee acts as a mild (**stimulus/ stimulant**).

17. I am afraid the project is far too expensive to be (**practical / practicable**).

18. His behavior at the party was most (**regretful / regrettable**).

19. No one has come up with a (**definite / definitive**) answer as to why this would be so.

20. People who emigrate to a new country usually take a while to (**adopt / adapt**) to the new way of life.

Test № 13

DNA Fingerprinting: A Tool for Medical Detective

Read the text and complete with the correct option A-C:

The use of (1) …... fragment length (2) …... (RFLPs) in DNA finger- printing has caused a (3) …… in many fields of biology. Nowhere has the impact of this technique been felt more than in forensics, the (4) …..... of information to be used as evidence in court proceedings. First used in a court case in 1986 in which blood (5) …… from males in an entire British village were tested to solve the rape and murder of two young women, DNA testing has since entered the mainstream of forensic science. Because the PCR (polymerase chain reaction) technique allows (6) …... of minute quantities of DNA, enough DNA to produce a NDA fingerprint can easily be obtained from a semen stain, cells at the base of a (7) ....., skin fragments found under a victim's fingernails after a struggle, or a speck of dried blood. Forensic scientists have recently discovered that they can swab off objects regularly handled by a suspect, such as a telephone handset, a briefcase handle, or the inside of vinyl gloves, and use DNA fingerprinting on the collected 'fingerprints' themselves.

Some fascinating cases have used DNA from other species to solve murders. When a Phoenix, Arizona, woman was found strangled near a palo verde tree in 1992, the prime suspect denied having been at the crime scene. However, palo verde (8) …… were found in the bed of the suspect's pickup truck. Homicide (9) ..... turned to Dr Timothy Helentjaris, then at the University of Arizona. In his research on the evolution of crop plants, he had found considerable differences of the DNA fingerprints of (10) ……plants.

Helentjaris was given the seeds from the suspect's truck along with seeds collected from a dozen palo verde trees in the area, only one of which was near the body. Without knowing which was which, Helentjaris (11) …... DNA from the seeds and used PCR to amplify it. DNA fingerprinting showed that the pattern from the seeds found in the truck exactly matched the pattern from only one of the dozen trees - the one nearest the body. In an important additional test, Helentjaris found that this pattern was also different from that of seeds collected from 18 trees at random sites around Phoenix. This information was (12) …… in (13) …… the suspect's alibi, and he was found guilty of first-degree murder.

DNA fingerprinting, combined with PCR, promises to revolutionize other areas of biology and medicine as well. For instance, a group of British and Russian scientists used PCR to identify the remains of the Russian royal family, Tsar Nicholas Romanov II, his wife, Alexandra, and three of their five children.

In 1997, Oxford researchers using DNA fingerprinting were able to (14) ….. the longest (15) …… (16) ….. ever traced. They extracted DNA from the bones of a 9000-year-old skeleton found in 1903 in a (17) …… near the town of Cheddar, England. Wondering if (18) ……. of the 'Cheddar Man' might still live in the area, they analysed DNA from local families; amazingly, they found a match in a Cheddar school-teacher.

1	A destruction	B restriction	C retraction
2	A polymerisms	B polymorphisms	C polylithisms
3	A revolution	B revolt	C riot
4	A collocation	B gathering	C collection
5	A examples	B species	C samples
6	A amplification	B implication	C simplification
7	A shaft of bone	B shaft of feather	C hair shaft

8	A weeds	B reeds	C seeds
9	A researchers	B investigators	C explorers
10	A individual	B separate	C detached
11	A elicited	B derived	C extracted
12	A critical	B crucian	C crucial
13	A demolishing	B embellishing	C abolishing
14	A pounce	B renounce	C announce
15	A humane	B human	C humanistic
16	A lineage	B linkage	C linage
17	A cave	B cavity	C hollow
18	A descendants	B ancestors	C ascendants

Part 3

ADDITIONAL READING

Text № 1 Science and Research at the University

Read, translate the text adequately, do the exercises that follow.

The main goal of an undergraduate is to obtain a certificate or a diploma and get a good job upon graduation. Most graduates are concerned with earning a good (or better) income and having a successful career in the future. A University degree opens up new opportunities in this area of life and activities.

Many Universities in Russia are doing their best to keep up with the present-day improvements, innovations in the society and in the world as well.

It should be mentioned that a multi-level system of education in this country was formed in the late 1990s. It offers courses of study which last for a four-year period granting a Bachelor's degree, and two more years of study leading to a Master's degree. Such a system aims at preparing the student for a job.

The teaching activities in the Biology Institute are divided into several main areas: Biology, Exact Sciences, Social Sciences, English and some other disciplines.

The Biology Institute includes several departments covering most aspects of Biology, Chemistry, English and the other subjects. The Biology Institute offers a wide range of courses which directly meet the varied needs of the biological profession today.

Formal teaching in the Biology Institute is performed by way of lectures, laboratory practicals, field excursions and personal study. All undergraduate students of the Biology Institute work under the supervision of their research advisers, who act as their experts and consultants offering advice on either academic or non-academic matters. This kind of activity allows the undergraduates to improve their knowledge, widen their experiences and learn new complex and specialized methods of their research. The Master's degree students are engaged in writing their course papers. By writing them, they learn to do individual research, obtain information from various sources, receive extensive data and draw their own conclusions.

They also try to overcome all difficulties, obstacles in their way and solve all problems. In doing so, the undergraduates have regular meetings with their research advisers throughout the

course involving discussions, presentations, projects, and marked essays.

The undergraduates major in the following fields of modern Biology:

- *Genetics*
- *Botany*
- *Biochemistry*
- *Microbiology*
- *Biotechnology*
- *Soil Science*
- *Human, Plant, and Animal Physiology*
- *Zoology*
- *Agronomy*
- *Ecology*

Genetics is the branch of Biology concerned with the study of heredity and variation. Classical genetics is based on the work of Gregor Mendel.

During the 20th century genetics expanded to overlap with the fields of ecology and animal behaviour, and important advances in biochemistry and microbiology led to the classification of the chemical nature of genes and the ways in which they can replicate and be transmitted, creating the field of molecular genetics.

In 2003 Human Genome Project (HGP) completed DNA sequencing of the human genome, 50 years after publication of Watson and Crick's paper on the structure of DNA.

Botany is the scientific study of plants, including their anatomy, morphology, physiology, biochemistry, taxonomy, cytology, genetics, ecology, evolution, and geographical distribution.

This subject is of great importance in horticulture, agriculture, biotechnology, forestry, land-use and conservation. The facilities to study plants include the Siberian Botanical garden with its experimental areas, and several well-equipped teaching and research laboratories. As far as the Botanical garden and the Herbarium are concerned, they have a lot of plant species ranging from ferns and tropical plants to hardy species of trees, shrubs and herbs of the Siberian flora.

Biochemistry is the study of the molecular basis of life. Biochemists investigate a diverse range of fundamental problems in plants, animals, microorganisms; the structure of individual molecules and the way in which this is related to biochemical function; the control of metabolism and the mechanism by which cellular activities are orchestrated to produce a precisely controlled yet adaptable pattern. The interaction between cells in tissues and between tissues and organs to achieve a balanced whole is investigated by the biochemist. The subject plays a

central role in many areas of Biology, and biochemical research provides the basis of new and exciting advances in a range of fields.

Biochemistry is of great importance in the sphere of medicine. The immune system has a molecular basis; this is the field which receives considerable emphasis in biochemical research. Other areas investigated by biochemists include communication between cells through hormones and the chemical basis of enzyme activity.

Biochemistry may be defined as the chemistry of living organisms, from the most primitive to very complicated ones, including human beings. The research into the chemistry of organisms is considered by means of three aspects. Static microbiology studies a combination of substances from which every living thing is constructed. The second aspect deals with all the complex transformations of substances. The third aspect has the aim of elucidating the biological significance or the physiological importance of chemical reactions in an organism. It is called functional biochemistry. The three trends of biochemistry investigation are closely interwoven and are complementary.

Microbiology. Of all the groups of organisms studied by biologists, microbes probably rank as the most important in terms of their impact on our daily lives. Within the scope of Microbiology come bacteria, viruses, fungi, algae and protozoa. All of these groups play vital roles in nature, nutrition, diseases and industrial processes. Microorganisms are the most biochemically versatile of all living things and their effects on us and the environment can be both beneficial and harmful. They are essential for the global cycling of nutrients, the decomposition of animal and plant remains and the fixation of atmospheric nitrogen. They can also cause numerous diseases of animals and plants, food spoilage and pollution. In addition, microbes are commercially important and are used to manufacture drugs, foods and drinks. Microbiologists are therefore concerned with the ecology, biochemistry and genetics of microorganisms and with their effects of their activities on human society.

Soil Science. This is the study of soils which are complex mixtures of weathered mineral materials from rocks, partially decomposed organic molecules, and a host of living organisms. The formation of soil depends on the parent material (i.e. the original material from which the soil is derived), the climate and topography of the area, the organisms present in the soil, and the time over which the soil has been developing. Soils are often classified in terms of their structure and texture. The structure of a soil is the way in which the individual soil particles are bound

together to form aggregates or peds. The structure types include platy, blocky, granular, and crumbs. The texture of a soil denotes the proportion of the various particle sizes that it contains. The four main texture classes are sand, silt, clay, and loam, of which loams are generally the best agricultural soils as they contain a mixture of all particle sizes. A number of distinct horizontal layers can often be distinguished in a vertical section (profile) of soil – these are known as soil horizons. Four basic horizons are common to most soils: an uppermost A horizon (or topsoil), containing the organic matter; an underlying B horizon (or subsoil), which contains little organic material and is strongly leached; a C horizon consisting of weathered rock; and a D horizon comprising the bedrock.

Soil erosion is the removal and thinning of the soil layer to climatic and physical processes, such as high rainfall, which is greatly accelerated by certain human activities, such as deforestation. Soil erosion can lead to a loss of agricultural land if unchecked, which eventually results in desertification.

Human, Plant, and Animal Physiology is the branch of Biology concerned with the vital functions of humans, plants, and animals, such as nutrition, respiration, reproduction and excretion. Physiologists study human as a whole. The physiologist views an animal as a highly integrated machine, adapting to the many stresses of life and growing, repairing and reproducing itself.

Physiology is also the basis of medicine: while the physiologist investigates how the healthy body functions, the doctor is involved when it goes wrong. Career opportunities for graduates in physiology are generally good.

Zoology is the study of all aspects of animal life. It seeks to explain how the living animal functions as an integrated whole and how it interacts with other living organisms and with the physical environment. This means that, although zoologists work at every level of biological organization from the cell to the community, they are particularly interested in how whole animals:

- are functionally integrated (physiology)
- interact with the environment (ecology and behaviour)
- are adapted to their lifestyle (evolution).

How organisms function and evolve is of central importance for the whole of biology and also essential for a clear understanding of the human environment.

Agronomy is the scientific study of soil management and the cultivation of crops. The use of land to raise crops for eating first started about 10,000 years ago. All plants grown for food have been developed over many centuries from wild plants, which have been progressively bred to give the best yields in different types of environment. Genes from wild plants are likely

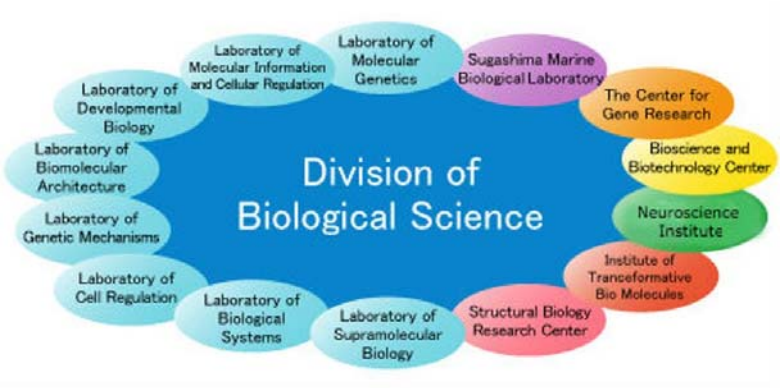
to be more hardy and resistant to disease, and are still kept in gene banks to strengthen new cultivated varieties.

The term **"Ecology"** comes from the Greek words "oikos" (household) and "logos" (study), therefore "ecology" means the "study of the household (nature)". Thus, Ecology is the scientific study of the distribution and abundance of living things and how the distribution and abundance are affected by interactions between the organisms and their environment. The word "environment" refers to everything around us: the air, the water and the land as well as the plants, animals, and microorganisms that inhabit them.

Ecology is usually regarded as a branch of biology, the general science that studies living organisms. Organisms can be studied at many different levels, from proteins and nucleic acids (in biochemistry and molecular biology), to cells (in cellular biology), to individuals (in botany, zoology, and other similar disciplines), and finally at the level of populations, communities, and ecosystems, to the biosphere as a whole.

Ecology is a multi-disciplinary subject. It should be mentioned that the term "ecology" was coined by the German zoologist, Ernst Haeckel, in 1866 to describe the "economics" of living forms.

Contemporary ecology consists of several sub-disciplines including population ecology, community ecology, conservation ecology, ecosystem ecology, spatial ecology, landscape ecology, physiological ecology, evolutionary ecology, functional ecology, behavioral ecology, etc.



I. Answer the following questions:

1. What is science?
2. What are the aims and means of science?
3. What is the main goal of every undergraduate?
4. What are the major areas of teaching activities in the Biology Institute?
5. The Master`s degree students of the Biology Institute are engaged in a variety of activities, aren`t they?
6. What fields of modern biology do the undergraduates of the Biology Institute major in?

II. Make a summary of the text paying attention to the facts you personally have found new, interesting, etc.

III. Suggested topics for discussion.

1. The role of science in human lives.
2. The structure and activities of the Biology Institute.
3. The outstanding scientists of TSU.
4. The field of biology you have chosen for your future work.
5. The way you work on research projects.
6. The important theoretical and applied results obtained in recent years in the field of your particular area of research.

Text № 2

Institute of Biology, Ecology, Soil Science, Agriculture and Forestry

Read, translate the text adequately, do the exercises that follow.

Nowadays, the National Research Tomsk State University is regarded as one of the country`s leading research and teaching higher educational institutions. Tomsk University was set up as the Imperial Siberian University in 1878. It should be noted that the University was established thanks to the tireless efforts and ideas of the progressively-minded people of that time. Prof. V.M. Florinsky and the greatest Russian chemist P.I. Mendeleev made a great contribution to the founding and opening of the first University in Siberia and the Far East. A hundred and forty years later, the grateful people of Russia erected a monument to these outstanding men of science. Thus, the University opened its doors to students in 1888. Originally, Tomsk University had only faculty - that of Medicine, and seventy-two students began to study at the University. The first professors who taught at the University had arrived in Tomsk from Moscow, St. Petersburg and Kazan. Professor N.I. Gezekhus (1845-1912) was appointed Rector of the first Siberian University.

As far as the Biology as a subject is concerned, it has been taught at Tomsk University since its establishment. The Biology Faculty was set up at the University in the 30s of the XXth century. In

1948, the Soil Science Department was included in the Biology Faculty and later was called the Bilology and Soil Studies Faculty. In the early 2000s, the Faculty became the Institute of Biology and has retained this status up to now.

In the 1990s, Russia entered a period of political, economic and social reforms. In the late 1990s, the transition to a multi-level system of education started. At present, this system includes several levels of courses leading to a Bachelor`s degree (four years of study) and a Master`s degree (two more years of study). There is also a post-graduate course intended for those people who are scientifically –minded and want to defend their theses.

Nowadays, the Biology Institute retains its position as one of the National Research Tomsk State University`s leading centres of teaching and learning natural science subjects and disciplines.

From a structural standpoint, the Biology Institute includes several departments – those of:

- Vertebrate and Invertebrate Zoology;
- Botany;
- Human and Animal Physiology;
- Soil Science and Soil Ecology;
- Plant Physiology and Bioengineering;
- Ichthyology and Hydrobiology;
- Forestry and Landscape Architecture.

Each department of the Biology Institute has its own characteristic features and specific avenues of investigation. These lines of investigation are integrated, complementary, and up-to-date.

In addition, several departments of the Biology Institute have been awarded a top rating for the quality of their research.

The biology students study various subjects and disciplines. They deal with Botany, Vertebrate and Invertebrate Zoology, Microbiology, Anatomy, Soil Science, Cytology and Genetics, Biotechnology, Ecology, etc. Besides these specialized disciplines, they are also offered courses of Higher Mathematics, Computer Science, Chemistry, Physics, History of Russia, Cultural Studies and English. Undergraduates major in their particular areas of science working under supervision of their research advisers. It should be remembered that a wide range of teaching techniques is employed (lectures, tutorials, seminars, practical work and supervised projects) at a Master`s degree level. Assessment is fulfilled by course work(essays, problem solving exercises, practical and project reports, oral communication and visual presentation skills, credit tests and examinations).

Computing and IT skills classes are now an essential component of virtually all courses. It is interesting to note that the traditional techniques are still used but they are losing dominance among the new methods of teaching in the University.

Moreover, the activities, tasks and objectives of the Biology Institute at the Research National Tomsk State University and those of the Herbarium named after P.N Krylov in association with the Siberian Botanical Garden (SBG) are integrated in the whole system of training highly-qualified specialists who have a wide choice of carries open to them.

The Herbarium is an institution which includes a great variety of the botanical resources. It is something like a library of dried and pressed plants arranged in such a manner that specific plants may be readily located and preserved. As far as the University park is concerned, it is famous for its native, endemic trees (pines, birches, bird cherry trees) as well as cultivated foreign plants. The University park is distinctive and attractive. It is beautiful in each season. University people enjoy having their time in the park and usually see its richness and diversity through the seasons. It is a seasonable pleasure featuring an array of changing delights as the year progresses: from snow drops in spring to the sweet bloom of summer, from glorious autumn colour to the icy beauty of winter.

In addition, the Botanical Garden at TSU came into being thanks to the University, because it needed a garden for growing medicinal plants for the Medical Faculty. It is important to emphasize that P.N. Krylov took an active part in laying out the garden and constructing the conservatory. The scientific gardener P.N. Krylov arrived in Tomsk from Kazan and with great

difficulty brought with him 700 potted plants, transporting them by horse-drawn carts and railway carriages.

As a matter of fact, the scientist organized 36 botanical expeditions, described 12 new plant species and a lot of intra-specific taxa. “The Siberian Flora” written by the researcher is considered to be the most complete and exact work which has ever been published. In his numerous scientific expeditions to explore the flora of the far-away regions he was always accompanied and assisted by his devoted colleague L.P. Sergievskaya.

Since then the Botanical Garden has transformed from a small plot into an exciting scene designed by P.N. Krylov and his enthusiastic followers.

Nowadays, the Siberian Botanical Garden (SBG) covers 126 hectares and offers much to see whatever the season. The unique Conservatory and Greenhouse complex (7000 square metres) and the Experimental area (114 hectares) are in operation now. It should be noted that its present-day plant funds range up to 6000 species, forms, varieties of tropical, subtropical, medicinal, horticultural, ornamental, rare and endangered plants.

Structurally, the SBG consists of nine research laboratories – those of introduction dendrology and landscape architecture; tropical and subtropical introduction; medicinal plant introduction; agricultural plant reproduction; flowering and

ornamental plants; biomorphology and cytogenetics; phytochemistry; seed studies and biotechnology; plant protection from pests and diseases.

Scientific and technical staff at the Botanical Garden is engaged in realizing many important projects. The development of the SBG is closely associated with inspirational people and their significant work.

Research activity of the scientific staff of the SBG is aimed at:

- introducing and developing useful natural and cultural floral species of the planet using the techniques of biotechnology, genetics and plant biochemistry;
- exploring the state of natural populations of rare and extinct plant species and preserving their genofund;
- working in the areas of ornamental dendrology and landscape architecture.

In conclusion it may be said that the Siberian Botanical Garden is a unique complex, a research institute having its own funds, conservatories, greenhouses, and dendroparks. This is our national resource and treasury. Today the SBG is still dedicated to promoting education, conservation and scientific research. The door of the SBG is open to understanding, enjoyment, and appreciation of the surrounding environment.

I. Answer the following questions:

1. Why is the Biology Institute rightly regarded as one of the University`s leading research and teaching faculties?
2. What is the modern structure of the Biology Institute at Tomsk State University?
3. What system of education is adopted at the Biology Institute?
4. What is it like being a Master`s degree student at the Biology Institute of Tomsk State University?

II. Make a summary of the text paying attention to the facts you personally have found new, interesting, etc.

III. Suggested topics for discussion.

1. The National Research Tomsk State University as the preserve of the country`s scientific, business elite and high academic standards.
2. The Siberian Botanical Garden (SBG) – the pride of "Siberian Athens".
3. The Herbarium of Tomsk University named after P.N. Krylov as an important plant preservation centre.
4. A wide variety of forms of teaching and learning at the University.
5. Research work and projects done by the scientific staff of the Biology Institute.

Text № 3

Nikolai Ivanovich Vavilov (1887 – 1943)

Read, translate the text adequately, do the exercises that follow.

N.I Vavilov was one of the most outstanding scientists of the XXth century: a biologist, geneticist, geographer, agronomist, and plant breeder. During three decades of tireless scientific work he travelled over five continents, amassed the largest collection in the world of species and strains of cultivated plants and developed theories on now utilize them for breeding new strains. The activities of N.I Vavilov were extraordinary varied, but they were all focused on the single objective: to increase agricultural production and provide humankind with more food. As early as in his student years, N.I. Vavilov showed scientific interests that determined his future

lines of research. His aim was to increase the productivity of agricultural plants and, thus, to eliminate famine in his long – suffering and large country.

N. I. Vavilov was born in Moscow in 1887 in a prominent textile manufacturing family. With his brother Sergei (a physicist and later the President of the Academy of Sciences of the USSR), his sister – Alexandra (a physician) and Lidia (a microbiologist) he received his early education in Moscow. Later he entered the Moscow Agricultural Institute which he graduated from in 1910.

As a student, N. Vavilov demonstrated a great scientific interest that determined his future focus on research work. It is interesting to note that he took a great interest in Darwin`s Theory in the light of the latest development of the biological sciences. In 1912 in his pioneering paper "Genetics and Agronomy" he outlined a programme which implied application of genetics to the improvement of cultivated plants. From his very first steps in science N. I Vavilov showed himself as a geographer, evolutionist and specialist in plant protection. It is noteworthy that all his scientific interests were interrelated; he was the first to see the possibility and the vital necessity of investigations into the cultivated plants from the viewpoint of genetics, evolution, and geography. N. I Vavilov managed to implement this scientific synthesis along with is tremendous organizational work in the area of agricultural science.

In this text the main facts of the biography of the great scientist are presented. In 1913 – 1914 N.I Vavilov studied wheat immunity to fungus diseases in the laboratory headed by W. Bateson in Great Britain, later he did research in the scientific laboratories of France and Germany.

Nikolai Ivanovich Vavilov and William Bateson.

In 1916 he organized and carried out botanical and geographical expeditions to Iran and Pamir.

Between 1917 and 1927 the researcher was a lecturer at the Department of Agriculture of the Saratov Agricultural Institute and in 1918 he became a Professor of this Institute. The scientist studied the peculiarities of cultivated plants growing in the region of the Volga and explored the variability of plants.

In 1920 he made one of his scientific discoveries and formulated the Law of Homologous Series in Hereditary Variation, which made it possible to systematize the data on variation and forecast the possibility of finding new plant varieties. He presented a report on the Law, of Homologous Series in Variation at the 3^{d} All – Russian Plant Breeding Congress held in Saratov in 1920. The participants appreciated the Congress as a historical event and declared N.I. Vavilov to be "The Mendeleev of biology".

Of great importance for the Soviet genetics was the organizing work of N. I. Vavilov. The scientist set up a Department of Genetics at the All – Union Institute of Plant Breeding in Leningrad.

in 1930 he became the head of the laboratory that four years later was reorganized into the Institute of Genetics of the Academy of Sciences of the USSR.

In 1940 N. I. Vavilov became Director of the Institute of Genetics of the Academy of Sciences of the USSR (now the Institute of General Genetics of the Russian Academy of Sciences). Many talented Soviet geneticists worked at that Institute, as well as a number of foreign scientists (H.J Muller from the USA was among them). Under the supervision of N.I. Vavilov the Institute carried out a comprehensive study of cultivated plants, their wild relatives and weeds. The collection of plant samples made by Vavilov and his co-workers included 200.000 recognizable forms. Numerous varieties of agricultural plants have been created on the basis of this collection.

The significance of N.I. Vavilov's theory has become especially important nowadays, with the occurrence of mass elimination of natural habitats and primitive agricultural systems. Not only specialists in this field but also the public at large have been attracted to the problems connected with the conservation of genetic pools of cultivated and wild plants. The gene bank of

cultivated plants created by N.I. Vavilov was among the first and the most extensive ones in the world at that time. Now it is maintained in the Institute of Plant Breeding in St. Petersburg. At present, similar gene banks have been organized in many countries, ensuring successful breeding of new varieties.

In conclusion it may be said that Vavilov's activities were widely recognized not only in the USSR, but also all over the world.

He had won awards throughout the world. In 1926 he was awarded The Order of Lenin for his work on the origin of cultivated plants. In 1923 the scientist was elected a Corresponding Member and in 1929 a Full Member of the Academy of Sciences of the USSR. In addition, he was a member of the British Royal Society, an Honorary Fellow of the Indian Academy of Sciences, the National Academies of Czechoslovakia, Scotland and Germany. It should be emphasized that N.I. Vavilov became a Member of the Linnean Society in London, a Member of the American Botanical Society and of many other national and international organizations. In other words, his reputation as a scientist was very high on a world – wide scale. He has made a great contribution to the development of world science. N.I Vavilov is a remarkable researcher whose work ranks with that of Ch. Darwin, C. Linnaeus, Gr. Mendel, T. Morgan and the other scientists.

N.I. Vavilov vs pseudo-scientist's views

N.I. Vavilov went down in the history of world science as a dramatic example of unbending courage in the fight for the freedom of a scientific thought. As he was enthusiastic about science and loved his job, he planned to reorganize the ineffective agricultural system in the USSR. His mission was to increase the agricultural productivity in order to eliminate famine and diseases in his native country. Unfortunately, the political situation in the USSR at that period was complicated because of numerous Stalin's repressions which also involved science. In the mid – 1930s the development of the biological science was greatly slowed down by the process of Stalin's purges. It should be noted that N.I. Vavilov was firmly convinced of his views and ideas and he never retreated from his line of genetics, selection, and the evolutionary theory. N.I. Vavilov's downfall came from the ambitious Trofim Lycenko who managed to win favour with Stalin. Moreover, this pseudo-scientist promised that he would get quick crop improvement on the basis of his techniques compared to N. I. Vavilov's slow process of systematic collection of wild varieties, hybridization, testing, and selection.

The public criticisms brought against N.I. Vavilov also included such things as giving too much attention to foreign science, wasting government money on useless collecting trips and supporting idealist Mendelian theories. It is interesting to

note that T.D Lycenko was a frantic opponent of N.I. Vavilov`s and his coworkers` views. A violent controversy between N.I. Vavilov and T.D. Lycenko lasted for a rather long period of time.

As far as T.D Lycenko is concerned, he did not recognize the laws of heredity and strongly opposed gentics and geneticists. The credo of Lycenko was the following: a) there are no genes as special units of heredity, a cell itself as a whole "possesses heredity"; b) the characteristics acquired in individual life are transmitted to descendants.

Such statements were unacceptable for geneticists of the second quarter of the XXth century and N.I. Vavilov upheld his point of view and principles taking part in polemic scientific discussions and disputes in the late 1930s. N.I. Vavilov was the main speaker at those sessions and he tried to put forward scientific arguments to contradict the unsubstantiated statements of T.D. Lycenko.

The last years of the scientist's life

In the mid-1930s the political situation in the country became more complicated than ever before and several talented colleagues and successors of N.I. Vavilov were arrested because they shared the scientist's views and ideas. All of them became political prisoners. In August 1940 N.I. Vavilov was arrested, tried and sentenced to death. He was accused of belonging to a rightist organization, spying for England, sabotaging agriculture,

and maintaining links with emigrés. The scientist spent years for the sentence to be implemented, when it was substituted by 20 years of prison. In January 1943 N.I. Vavilov tragically died of hunger and was buried in a common prison grave in Saratov. In conclusion it may be said that the renowned Russian scientist Nikolay Ivanovich Vavilov, whose life and job were related to the problem of "feeding the world" died of starvation, scurvy and dystrophy.

A vivid testimony to a Soviet journalist was presented by N.J. Muller who had worked in the Institute headed by N.I. Vavilov from 1933 to 1937. The testimony was the following: "He was a truly great man in very varied respects: scientific, administrative, human. Unlike some exceptional people, he was a thorough extrovert, without any perceptible trace of a feeling of inferiority or persecution or – in the attempt it compensates for them of superiority.

He lost himself in work, service, solving of problems, analysis and integration, perceptivity, and aesthetic appreciation. Having wide and deep awareness, he was also more life-loving, life-giving and life-building than anyone else I have ever known. His efforts and his example have not really been lost".

Nevertheless, the memory of N.I. Vavilov has been preserved by his followers. During that tragic period, they kept on gathering Vavilov's manuscripts, documents and photos. Since

mid-1950s after the official rehabilitation of the scientist, hundreds of books and articles devoted to his life and scientific accomplishments have been published. Memorial displays have been opened in Moscow, St. Peterburg, Saratov, and Poltava. The name of N.I. Vavilov has been given to the Russian Society of Geneticists and Breeders, the Institute of General Genetics of the Academy of Sciences, the Institute of Plant Industry, and the Saratov Agriculture Institute.

Thus, the whole life of N.I. Vavilov is a remarkable example of the self-sacrificing devotion to science, his homeland, and humanity.

Comprehension

I. Answer the following questions:

1. When did N.I. Vavilov show scientific interests that determined his future lines of research?
2. What was the major subject of his investigations?
3. What scientific discoveries did the scientist make?
4. Were N.I. Vavilov`s activities widely recognized all over the world?
5. In what way did the political regime of that time influence the researcher`s life and activity?

6. N.I. Vavilov was a truly great man in very varied respects: scientific, administrative, human, wasn`t he?

II. Make a summary of the text paying attention to the facts you personally have found new, interesting, etc.

III. Suggested topics for discussion:

1. The Russian outstanding scientist N.I. Vavilov and his great contribution to the genetics development.
2. The scientific views and conceptions of N.I. Vavilov versus the credo of his opponent T.D. Lycenko.
3. The story of Stalin`s persecution of one of the great scientists of the XXth century.
4. The personality of N.I. Vavilov and his exploit in the name of science.
5. N.I. Vavilov, the martyr to genetic truth.

Text №4.

J.F Crow "N.I. Vavilov, Martyr to Genetic Truth"

Read, translate the abstract adequately, do the exercises that follow.

VAVILOV'S interest in wild relatives of cultivated species led to ambitious expeditions throughout the world. By 1940 more than 250,000 plants had been collected. These were not just museum specimens, but seeds and live plants. They were studied taxonomically, cytologically and genetically in more than 400 experiment stations throughout the Soviet Union. The idea was to provide breeders with the full genetic potential of the species and the means for creating new and better varieties. He had a program of testing each variety in many habitats to find those best suited to each particular environment. He was especially interested in finding strains that would mature and produce high yields in the short growing season that plagues much of the Soviet Union. In short, he carried out on an unprecedented scale the kind of plant breeding program that has since been practiced in agricultural experiment stations throughout the world. The All-Union Institute of Plant Breeding, of which he was the head, at one time had some 20,000 workers.

VAVILOV noted that closely related species had similar variations. In those pre-molecular days, similarity of variants was one of the best indicators of genetic relationship. His law of

"homologous variation" held that the more similar species are, their patterns of variation. This way of classification became very popular, and he was sometimes able to predict that a particular variant would be found. This predictive idea was even compared to MENDELEEV'S periodic table. The theory was naturally controversial, and some took it as evidence against Darwinism. L. S. BERG, for example, regarded similar variations in related species as evidence for a predetermined evolution, "homogenesis" as he called it. Later, VAVILOV relied on additional techniques, such as cytogenetics; but he always regarded homologous variation as an important measure of genetic relationship.

The work of greatest lasting influence was his search for the origins of domestic plants. He formulated the hypothesis that locales in which there is the largest amount of genetic variability are the ones from which new varieties, the future cultivars, arose. VAVILOV found some parts of the world to be particularly rich in varieties, and he regarded these as the centers from which the crop plants were descended. These areas also were often the sites of origin of civilizations.

In retrospect, the hypothesis has not stood up very well. Cultivated varieties have not regularly come from the areas of greatest diversity. But, such centers have turned out to be of great utility in the search for sources of new germ plasm for plant improvement. VAVILOV'S foresight shines through in these times of concern for preservation of genetic diversity. Ironically, the

work that was tarred as idealistic has turned out to be of great practicality, far more so than LYSENKO'S fanciful schemes.

LYSENKO was an unmitigated disaster, not only for Soviet genetics but for agriculture as well. He fostered one hare-brained scheme after another, each being put into practice on a wide scale. Controlled experiments and the efficient experimental designs introduced by R. A. FISHER were no part of his program. His lack of controlled pollination led to varieties losing their identity. Hybrid corn, derived from puny inbred parents, was derided as fatuous Morgan-Mendelism. VAVILOV'S efforts to introduce American corn-breeding methods were totally rejected. The wonder is that agricultural production did not fall still lower.

VAVILOV was a strong believer in the importance of selection, both for evolution and as a tool for the plant breeder. Finding diverse types, hybridizing them, and especially selecting among the recombinants, gave the best hope for producing better plants. And, of course, he was right. But the slow and certain program he was advocating could not compete in the political arena with those who promised instant gratification. Here lies a lesson for all science.

VAVILOV'S foresight is preserved in the Vavilov Institute in St. Petersburg, now one of the world's largest and most varied repositories of plant germ plasm. It is located in one of the central squares and VAVILOV now holds a position of high respect, one more example of the custom-not confined to the Soviet Union-of

killing people before honoring them.

Throughout his tragically truncated life, VAVILOV had both scientific and utilitarian goals. He thought of his wide-ranging geographical studies-more than 40 trips outside the Soviet Union and many more within-as adding to our understanding of evolution by natural selection. But it was also a way of improving plants and adapting them to new areas. He had the resources to carry out such a program, and in time would surely have produced the results he foresaw. He believed that the Soviet Union gave scientists a better opportunity to advance knowledge and serve mankind than any other country, and for this reason overlooked the crudities and cruelties of the regime. Alas, the crudities and cruelties soon predominated. VAVILOV'S favorite saying, particularly poignant as it turned out, was: "Life is short; hurry." [17]

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Tell the text according to the following plan:

1. N.I. Vavilov`s interest in wild varieties of cultivated species.
2. The essence of the Law of Homologous Series in Hereditary Variation formulated by the scientist.
3. N.I. Vavilov`s foresight with regard to preservation of genetic diversity;
4. Comment on N.I. Vavilov`s favorite saying "Life is short, hurry"

Express your personal opinion concerning all the events connected with N.I. Vavilov`s life and activity. Use the appropriate speech markers and formulas of communication.

Prepare a presentation on the basis of the reading. Your task is to characterize N.I. Vavilov as an outstanding personality, a great scientist of the XXth century.

Conference Participation

How and why should I best participate in conferences?

The main reasons for researchers to participate in scientific conferences are the following:

- to get informed about the state-of-the-art;
- to present their own research, and get reactions from peers;
- to have their paper published in the conference proceedings;
- to meet others working in the same domain.

While the first two reasons may seem most obvious, in practice the last two are more important. The reason is that there are other methods to get informed or to present your research, e.g. using preprints on the web, which demand less time and money than traveling to conferences. Moreover, the typical time slot in a conference for presenting a paper (about 20 minutes) is too short to effectively convey complex, technical and novel ideas. At best, the presentation will create sufficient interest so that listeners get motivated to investigate the work further, by contacting the speakers, or reading their papers.

On the other hand, publication typically happens more quickly and easily via proceedings, where there is a tight deadline, than via journals. Moreover, acceptance of papers for publication is the

most common demand of funding agencies, both to sponsor conference participation and to fund research in general. Finally, nothing can as yet replace face-to-face conversation in a pleasant, informal setting, such as a conference dinner or coffee break, as a way to quickly exchange a variety of experiences, establish personal relationships and thus perhaps lay the foundation for future collaboration.

This implies some tips for effective conference-participation that will not be obvious to beginning researchers:

- the best conferences are not the biggest or those with the most famous speakers, but those with the best opportunities for informal contact. Small, intimate workshops are usually more effective than huge conferences with hundreds or thousands of participants;
- almost no researchers travel to conferences abroad without presenting a paper, since otherwise they would not get any travel allowance or publication;
- conference presentations should not aim at completeness or thoroughness, but at raising interest, details can always be given in reply to questions later or in the paper for the proceedings;
- don't feel obliged to participate in all the sessions of what is typically a grueling breakfast to dinner schedule; rather use the

occasion to start talking to others, who may also be hanging out around the coffee place or dinner hall.

Typical Conference Organization

For the prospective participant, a scientific conference starts with a First announcement and Call for Papers (CFP). The CFP is a text, typically circulated via electronic mailing lists, and stored on the conferences website, that announces the general objectives of the planned conferences and lists basic information such as time, place, organizers and scientific committee. Its most important function is to invite scientists world-wide to submit papers for possible presentation at the conference. Therefore, it lists general requirements for submissions such as length (from a half page abstract to a 20 page full paper), address and deadline for submission.

Selection of papers

If you are interested to participate in the conference, you will submit a paper/abstract to the organizers. They will pass it on the members of the scientific/program committee for refereeing. On the basis of the referee report and the number of available slots in the program, the conference chair will decide whether your paper can be accepted or not. You should get an acceptance/rejection message before a fixed deadline, typically not later than a month

or two after the submission deadline and 3-4 months before the start of the conference. With your letter of acceptance, you can ask for funding for travel, accommodation, and conference registration, all of which can be pretty expensive.

Sometimes papers can be accepted either for oral presentation, or as posters. In the latter case, you are expected to turn the paper into a large format text with illustrations, good for visual inspection, that will be hung on walls or panels in the conference center. At a designated time, you will be expected to stand near your poster in order to be able to answer eventual questions about it. Posters are typically used to give less good contributions, still the chance to be presented, without taking time in the conference schedule.

If your paper/poster is accepted, you may be asked to prepare a final document version of it, before or after the conference, for publication in the conference proceedings. Proceedings are typically published as stand-alone volumes, though sometimes they are turned into special issues of journals, or published only electronically on the web. Final versions are typically more polished, extended and corrected compared to initial submissions, and may need to fulfill detailed formatting requirements.

The conference program

Once all contributions have been selected, the conference organizers will be able to produce a detailed conference program. This will typically include the following sections:

- **registration**: where you pay or confirm payment of the registration fee, and in return receive a badge identifying you as participant, plus documentation such as the latest program, invitations to social events, etc.

- **plenary sessions**: general opening and closing of the conference, panel discussions, and talks by "invited" speakers, i.e. renowned experts in the domain, whose costs are paid by the organizers, presenting the "state-of-the-art".

- **parallel sessions**: more specialized sessions with "contributing" speakers (selected on the basis of submissions, and having to pay to participate) that take place simultaneously in different rooms. Often such sessions or "symposia" are organized by their chairperson independently of the main conference committee, who is responsible for the focus and the selection of contributors. Smaller conferences (workshops) may not have parallel sessions.

- **social events**: coffee breaks, lunches, receptions, conference dinner, excursions, etc.

Typical international conferences last 3-5 days, starting around noon on the first day to give participants the time to register, and ending on the afternoon of the last day, with sometimes a half-day break in the middle for a touristic excursion.

In spite of this seemingly short duration, conferences are typically exhausting, not only because of all of the stress accompanying travel and presentation, but because participants tend to be engaged in listening to/participating in highly intellectual conversation from morning till evening. Participants generally return home tired but stimulated and exhilarated by all the new ideas, information, contacts, and plans they got. Unfortunately, most of those never get realized, as the participants come back home to everyday routine with all its more pressing and practical problems...

Answer the following questions on the text:

1. Have you ever participated in international conferences/symposia/congresses?
2. What are the main reasons for researchers to participate in scientific conferences?
3. What are the tips for an effective conference participation?
4. Can a prospective participant describe a typical conference procedure?
5. How are scientific papers selected to participate in the conference?

6. What sections does a typical conference program include?
7. When did you last take part in a conference?
8. Do you find your English sufficient/adequate to participate in the international conference?
9. Why is it necessary/important for a researcher to know foreign languages?

Suggested topics for discussion.

1. The importance of holding various conferences in the world of science.
2. The main reasons for researchers to participate in scientific conferences.
3. Tips for an effective conference organization.
4. A typical conference procedure.
5. Selection of scientific papers for the conference participation.
6. A typical conference program.
7. The significance of international conferences/symposia/forums for young University researchers.
8. The art of making presentations.

"Science Slam" International Conference

In this abstract ***Kseniia Karbysheva***, a post-graduate student of the Biology Institute, gives an original account of her participation in a "Science Slam" International Project. The text below describes the procedure of the implementation of the project.

Read the text and comment on the statements presented. While doing it, use the appropriate formulas of communication:

"Science Slam" is an international project where scientists present their original study in a given time frame (max. 10 minutes) in front of a non-expert audience. The aim of the project is to

popularize science and scientific knowledge to a diverse audience in an entertaining way. “Science Slam” usually takes place in a night club or a bar: six researchers speak without any notes one after another and the audience decides the winner giving him the applause at the end. The winner of the “Slam” is awarded with a pair of boxing gloves.

My first “Science Slam” took place in 2015 when I was a second-year M.S. student. Among other five slammers I presented the results of my graduate study on legume-rhizobial symbiosis at a very popular night club “Pravda”. After that I started giving and organizing pop-sci lectures in Tomsk and all over Russia.

Few years later, in 2018, “Deutsch-Russisches Forum”, an organization which is recognized as a locomotive power for the Germany and Russia bilateral relations’ development, together with American funding institution “Fulbright Germany” announced the first 3-lateral Science Slam between Germany, Russia and the USA to be held in the legendary Berlin night club SO36. To apply for the project young scientists from these countries were to clearly present their research using a two-minute video film. The other very important criterion was proficiency in English. The nomination procedure took several months, but finally I got the invitation letter from the organizing committee. Next 4 weeks I had a 25-hour working day as I had to fulfill my PhD field study plan and to prepare my new “Science

Slam" talk. I decided to present the results of my ecology and physiology research of ectomycorrhizal associations in *Pinus sibirica*. To make this talk interesting and easily understandable I had several trainings with "Science Slam" Tomsk organizing team and around 10 one-hour Skype sessions with Gregor Buning who is a high-level coach and Science Slam founder. It was agreed that the best analogue showing the peculiarities of mutualistic relationships between photo- and fungal symbionts is a love-story between a young man and a woman. Finally, my presentation was ready, my EU visa was obtained and I departed for Berlin.

There were a few trainings planned in Berlin including the rehearsal on the stage, but I had the opportunity to get to know better the other Slammers: Daniel Angerhausen, professor of astronomy, Chelsea Nnebe, an MS-student in neurology, Lauren Davidson, a grantee studying innovative biomimetic materials for water filtering, Nikita Meshcheulov, a civil engineer and Frieder Neunhöffer, sociologist. All the presentations were bright and humorous, but sophisticated Berlin audience got highest interest in my research and gave the loudest applause for my presentation. An informal afterparty accomplished the wonderful evening.

Kseniia Karbysheva

Vertebrate zoology and ecology PhD-student

Biological Institute

Tomsk State University

I. Explain the following things and express your personal opinion concerning "Science Slam" International conference:

a) the meaning of the word combination "Science Slam";

b) the role of international projects in the lives of young researchers or those people who want to take part in an activity of a similar type;
c) proficiency in English to apply for international projects;
d) the main reasons for researchers to participate in scientific conferences, symposia, forums.

Part IV

GRAMMAR REFERENCE

Перевод атрибутивных конструкций

Перевод атрибутивных конструкций, состоящих из «цепочки» существительных, представляет определенную трудность. Главным словом в этой группе слов является последнее ключевое слово, а стоящие перед ним слова являются определением к нему.

Чтобы правильно перевести словосочетания, необходимо проанализировать внутренние смысловые связи между его членами.

Двучленные сочетания слов. Первый член такого словосочетания, выраженный именем существительным, переводится на русский язык следующим образом:

a) именем прилагательным;
b) именем существительным в родительном падеже;
c) именем существительным с предлогом;
d) придаточным предложением.

При многозначности двучленного сочетания необходимо обращаться к широкому контексту.

Иллюстративные контексты:

University books – университетские книги, книги об университете

Labour conditions – условия труда

The Security Council – Совет Безопасности

Oil conference – Конференция стран участников по добыче нефти

Oil spill – нефтяное пятно, разлившееся на поверхности воды

The World Health Organization – Всемирная Организация Здравоохранения (ВОЗ)

The Russian fuel resources – топливные ресурсы России

Forest products company – компания, занимающаяся переработкой лесопродуктов

Cell growth rate increase – повышение скорости (темпа) роста клеток

The air traffic controller error– ошибка авиадиспетчера

An animal behaviour student – студент – этолог (Этология - раздел зоологии, изучающий повадки и поведение животных)

Disaster-prone areas – районы, подверженные стихийным бедствиям

A failure-prone device – ненадежный прибор, или прибор, склонный к отказам

I. Translate into Russian:

1. Pesticide resistance
2. Accident prevention
3. City hall officials
4. Ozone layer depletion
5. Communication system
6. Energy department spokesman
7. Kidney transplant success
8. A new space satellite

9. Low temperature nitrogen absorption
10. Metal work reorganization conference
11. Manchester ship canal reconstruction
12. Improvement production efficiency
13. Energy department spokesman
14. Raw materials production countries

II. Translate into English:

1. Это не сила аргумента, а аргумент силы.
2. Студенты – экологи изучают повадки и поведение животных, и мир фауны им хорошо знаком.
3. В этом регионе система зашиты растений оставляет желать много лучшего.
4. Разработан ряд технологий для того, чтобы измерять загрязнение воды и воздуха.
5. Конференция стран, производящих сырье, намечена на ноябрь текущего года.
6. В этом районе вскоре будет построен современный научно-исследовательский центр.
7. За последнее время в мировой прессе появилось немало сообщений об истощении озонового слоя.
8. Это событие вызвало огромный интерес в СМИ, но так и остается необъяснимым.

9. За последние десятилетия темпы вымирания видов на земле стремительно возросли.

10. Традиционный метод выращивания кристаллов заслуживает особого внимания.

Перевод отрицания

В английском и русском языках существуют различия в правилах оформления и перевода отрицательных предложений.

При построении отрицания в английском предложении и его соответствующего перевода на русский язык следует учитывать следующее:

1. Английское простое предложение имеет одно отрицание, а в русском их может быть несколько.
2. В сложном предложении может быть два отрицания, как в главном, так и в придаточном предложении. Следовательно, возможно 2 варианта перевода.
3. Отрицательные предложения часто бывают эмфатическими по своей сути. Эмфаза, т.е. усилительная конструкция, лексически передаётся на русском языке путем добавления слова **вовсе**.
4. Сочетание ***not - until*** переводится антонимическим способом с добавлением слов ***лишь*** или ***только.***
5. При наличии отрицательной частицы ***not*** и следующего за ней прилагательного или наречия с отрицательной приставкой (префиксом), также используется антонимический способ перевода.
6. Если в английском предложении имеются два отрицания, то в русском предложении в процессе перевода

используются грамматические и лексические средства выражения, характерные для данного языка. Иногда в этом случае прибегают к антонимическому переводу.

7. Наречие ***never*** употребляется в качестве категорического отрицания ***«ни разу не»***.
8. Слово ***fail*** также может употребляться в функции двойного усилительного отрицания.

Now practice:

I. Compare the illustrative contexts both in English and Russian.

1. To put it mildly, only several experiments conducted in such a way have led to good results. – *Мягко выражаясь, только некоторые эксперименты, проведенные таким образом, привели к хорошим результатам.*

2. I don't think you are right. – *Думаю, что вы не правы*.

3. They have done nothing to solve this complicated problem successfully. – *Они ничего не сделали, чтобы успешно решить эту сложную проблему.*

4. He is no plant breeder in its broadest sense. – *Он вовсе не селекционер в самом широком смысле этого слова.*

5. You will fail unless you work harder. – *Вы не добьетесь успеха, если не будете трудиться еще усерднее.*

6. Neither of these statements is true. – *Ни одно из этих утверждений не является верным.*

7. Their preliminary ideas, however, have neither reached a general solution nor a practical application. – *Однако, их предварительные идеи не привели ни к принятию общего решения, ни к какому-либо практическому применению.*

8. Neither of these trainees wants to participate in such a complicated experiment. – *Ни один из этих практикантов не хочет участвовать в таком сложном эксперименте.*

9. Not until Academician I.P. Pavlov made his famous discovery did scientists realize this law. – *Только тогда, когда академик И.П. Павлов сделал свое знаменитое открытие, ученые осознали значение этого закона.*

10. It is not an unfavorable moment to put an end to such an imprudent solution. – *Весьма благоприятный момент положить конец такому безрассудному решению*.

11. I don't at all disbelieve you. – *Я вполне вам верю*. (Дословный перевод типа «Я не не верю вам» просто невозможен)

II. Translate the following proverbs into Russian and comment upon their meanings:

1. Of two evils choose the least.
2. If the young man would and the old man could, there would be nothing undone.

3. Dogs that put up many hares kill none.
4. No man can serve two masters.
5. Too much butter won't spoil the porridge.
6. A horse that will not carry a saddle must have no oats.
7. One cannot make an omelette without breaking eggs.
8. Love is neither bought nor sold.
9. A man cannot give what he hasn't got.
10. Never offer to teach fish to swim. Don't teach the dog to bark.
11. All is not gold that glitters.
12. No flying from fate.
13. Don't halloo (or whistle, shout) till you are out of the wood.
14. Cast no greedy eye at another man's pie.
15. Nothing stings like the truth.

III. Translate the following sentences into English:

1. Весьма благоприятный момент обсудить все наши проблемы и найти выход из сложившейся ситуации.
2. Мы не можем бездействовать сейчас.
3. Они не смогли прийти к общему соглашению, и их постигла неудача.
4. Она вовсе не почвовед в самом широком понимании значения этого слова.
5. Ни он, ни она не узнают об этом эксперименте.

6. Не учи ученого. Он и так все знает.
7. Они ни разу не наблюдал это явление.
8. После того как ученый сделал свое знаменитое открытие, весь мир осознал значение этого закона.

Модальные глаголы и их эквиваленты

К ним относятся следующие модальные глаголы: **can, could, may, might, will, would, shall, should, must, have to, need, ought to**.

Модальные глаголы действия не обозначают, они употребляются в сочетании с основными глаголами для выражения характера действия, таких как, например, способность, обязательство сделать что-либо, разрешение/позволение, уверенность разной степени, условие.

Can - обозначает физическую, умственную способность совершения действия.

He can speak Spanish very well.

to be able to – является эквивалентом глагола и употребляется чаще всего в предложениях, выражающих будущее действие.

I will be able to meet you at the airport tomorrow.

Can (could) - также выражает сомнение, удивление, недоверие, невероятность действия:

It can't be true. - Это не может быть правдой.

They could not be discussing such issues at the session. - *Не может быть, чтобы они обсуждали такие вопросы на заседании.*

Could he have learnt Italian in a month's time? - *Разве он мог выучить итальянский за месяц?*

Could she have made such an experiment? – *Неужели она провела такой эксперимент?*

May выражает разрешение, позволение что-либо сделать:

You may put your bag in this place. – *Вы можете положить свою сумку на этом месте.*

to be allowed to – эквивалент глагола для выражения разрешения

He will be allowed to retake his English exam. – *Ему разрешат пересдать экзамен по английскому языку.*

might

He may (might) come soon. – *Возможно, (не исключено), что он скоро придет. В первом случае возможность относительно велика, во втором - возможность невелика.*

They might have gone somewhere. – *Вероятно, они куда-то уехали. Действие относится к прошлому моменту. Вероятность их очень слабая.*

Must (to have to)

Этот модальный глагол обозначает долженствование и переводится *должен, должна, должны.*

“The sick child must stay in bed,” the doctor said. – *«Больной ребенок должен оставаться в постели», - сказал доктор.*

В этом значении у модального глагола **must** есть два эквивалента - глаголы to be (to) и to have (to).

Must также означает вероятность совершения действия, но в отличие от *may* и *might* очень высокую степень.

The road is very slippery; an accident must happen here. – *Дорога очень скользкая, должно быть, здесь часто случается аварии.*

He must be making an experiment in this laboratory now. – *Он должно быть проводит сейчас эксперимент в этой лаборатории.*

Для выражения долженствования также используются **to be to** и **to have to**

The classes at the university are to begin at 8:45. – *Занятия в университете должны начаться в 8:45. (по расписанию)*

I have to go on business to Moscow for a couple of days. – *Я на пару дней должен (вынужден) уехать в командировку в Москву.*

Глагол **shall** согласуется с существительными и местоимениями, придавая предложению легкий оттенок модальности.

Shall we go there tomorrow? – Следует ли нам идти туда завтра?

Глагол **would** используется для образования форм сослагательного наклонения. Глагол **should** используется в значении следует, следовало бы (совет, пожелание), не следовало бы (упрек).

You shouldn't smoke here.

You should have spoken to Prof. Smirnov first.

Now practice:

I. Spot the modal verbs, define their functions and trans late the sentences into Russian:

1. Everything should be done very carefully.
2. You must not get upset: everything will probably turn out all right.
3. A) They may be having a conference.

   B) They might be having a session now.

4. Never put off till tomorrow what you can do today.
5. She must be a very experienced lecturer of Biology.
6. A female crocodile may/can lay thirty-forty eggs.
7. May I use your mobile phone, please?
8. Your colleagues ought to know about this event by all means.

9. You should not have done it yourself. All you had to do was ask me.

10. The experiment is to be conducted by all means.

II. Translate into English:

1) Мы не можем позволить себе тратить время на обсуждение неактуальных вопросов.
2) Можно мне просмотреть этот журнал?
3) Возможно, он сейчас находится лаборатории.
4) Я смогу помочь ему, но он хочет все делать сам.
5) Вам не следует печатать эту статью в новом журнале.
6) Его ответ на этот вопрос может дать ключ к решению всей проблемы.
7) Можно мне пойти туда? Нет, нельзя этого делать.
8) Вам следует позаботиться о точности проведения эксперимента.

Многофункциональность Should и Would

1) **Should** используется как самостоятельный модальный глагол для выражения долженствования, совета, рекомендации и переводится как «должен, следует». E.g. You should help your colleague to conduct this experiment in a better way. **Перевод:** Вам следует помочь	1) **Would** используется в модальном значении- выражает волю, желание, настояние, возможность. E.g. I would direct some critical remarks to the author of this article. **Перевод:** Мне хотелось бы высказать несколько критических замечаний

своему коллеге провести этот эксперимент лучшим способом. 2) **Should** как вспомогательный глагол используется для образования сослагательного наклонения. Эта сложная, аналитическая форма употребляется в простых, главных и придаточных предложениях. A) I should like to give my considerations on this subject. **Перевод:** Мне хотелось бы высказать свои соображения по этому вопросу. B) Should используется в оборотах: It is necessary; it is important; it is desirable that … should. E.g. It is desirable that this technology(should) be tested in practice. **Перевод:** Желательно, чтобы эта технология была проверена на практике. C) В придаточных предложениях со всеми	автору этой статьи. 2) **Would** как вспомогательный глагол употребляется для образования сослагательного наклонения. **Would** используется как в главном, так и в придаточном предложениях II и III типов условия. E.g If the biosphere had not emerged, living organic matter and soil would not have appeared. **Перевод:** Если бы не возникла биосфера, то не появились бы живое органическое вещество и почва. E.g If we had a combination of several factors, the plans would show its maximum of productivity. **Перевод:** Если бы у нас было сочетание нескольких факторов, то растения проявили бы максимум своей

лицами в ед. и мн. числе. e.g. The research adviser required that the post- graduate (should) explain the choice of the experimental method. **Перевод**: Научный руководитель потребовал, чтобы аспирант объяснил выбор экспериментального метода. D) Should употребляется в качестве вспомогательного глагола в условных предложениях II и III типов условия. E.g. We should use this method of work if it were efficient. **Перевод:** Мы бы внедрили этот метод работы, если бы он был эффективный. E.g We should have introduced this method of work a long time ago if it had been effective. **Перевод**: Мы бы давно внедрили этот метод работы, если бы он был эффективным. В сочетании с Perfect infinitive **Should** выражает наставление, совет, упрек, невыполненную	продуктивности. 3) **Would** передает повторяющееся действие и переводится словом обычно. e.g. He would test the devices before putting them into service. Перевод: Он обычно испытывал приборы до того, как вводить их в эксплуатацию. 4) **Would** используется как вспомогательный глагол при согласовании времен, чтобы передать будущее время. E.g Charles Darwin set sail in late December 1831 on a journey that would take him around the world. **Перевод**: Ч. Дарвин отправился в морское путешествие, которое будет совершено вокруг Земного шара. 5) **Would** употребляется также и в вежливых формах, выражающих просьбу, предложения и приглашения. E.g Would you (kindly) show

рекомендацию. E.g. You should have worked harder in order to obtain good experimental results. **Перевод:** Вам бы следовало трудиться упорнее, для того, чтобы получить хорошие экспериментальные результаты. 3) **Should** используется как вспомогательный глагол при согласовании времен - передает будущее время. We said that we should do our best to take these problems by all means. **Перевод:** Мы сказали, что во что бы то ни стало сделаем все возможное, чтобы урегулировать эти проблемы.	this laboratory device to us? **Перевод**: Пожалуйста, покажите нам этот лабораторный прибор.

Translate into English using "should" or "would" in the following sentences:

1. Вам следовало бы пересмотреть это решение.
2. Лаборант обычно приходил рано и готовил реактивы и приборы для проведения экспериментов.
3. Если бы не Сибирский ботанический сад, студенты не узнали бы об огромном разнообразии многих видов растений.

4. Важно, чтобы вы сдали свои экзамены успешно и приступили к новой работе.
5. Руководитель потребовал, чтобы этот научный доклад был переведен как можно скорее.
6. Если бы мы сравнили клетку с работой химического комбината, то мы бы увидели, что клетка устроена гораздо сложнее.
7. Если бы он выступил на конференции в прошлый раз, то его доклад был бы одним из лучших.

Страдательный залог (Passive Voice)

Форма залога показывает, является ли подлежащее в предложении (лицо или предмет) производителем или объектом действия, выраженного сказуемым.

Страдательный залог (Passive Voice) показывает, что лицо или предмет, выраженное подлежащим, испытывает действие на себе:

England is often compared with a flowering garden. – *Англию часто сравнивают с цветущим садом.*

The life cycle of a typical annual plant is divided into several stages. – *Жизненный цикл обычного однолетнего растения делится на несколько стадий.*

Страдательный залог употребляется, когда исполнитель действия очевиден или несущественен, или, когда действие или его результат более интересны, чем сам исполнитель.

Для построения предложения в форме страдательного залога необходим вспомогательный глагол **TO BE** в соответствующем времени, лице и числе и **причастие прошедшего времени (*Participle II*)** смыслового глагола:

Yellowstone National Park in the USA was intended to safeguard communities of plants and animals. – *Йеллоустоунский национальный парк в США был предназначен для сохранения сообществ растений и животных.*

These experiments have already been performed in this laboratory. – *Эти эксперименты уже проведены в этой лаборатории.*

В **отрицательных предложениях** частица **not** стоит после вспомогательного глагола, а если их несколько, то после первого из них:

The lab-assistant **has not been seen** anywhere. – *Лаборанта нигде не видели.*

В вопросительных предложениях частица not ставится после вспомогательного глагола, а если их несколько, то после первого из них:

Were these issues discussed yesterday? – *Обсуждали ли эти вопросы вчера?*

Таблица времен страдательного залога

Tense	Simple	Continuous	Perfect
Present	Research is done	Research is being done	Research has been done

Past	Research was done	Research was being done	Research had been done
Future	Research will be done	----------	Research will have been done

Употребление и перевод глаголов в страдательном залоге

Значение и употребление времен глагола в страдательном залоге такое же, как и у времен в активном залоге.

В английском языке в страдательном залоге употребляются переходные глаголы, а также некоторые непереходные глаголы. Примеры предложений с переходными глаголами в страдательном залоге:

By the middle of the nineteenth century about sixty different chemical elements **had been discovered.** – *К середине XIX века было обнаружено около 60 различных химических элементов.*

The delegates **will be met** at the station. – *Делегатов встретят на станции.*

Как видно из приведенных примеров, глагол в страдательном залоге в английском языке можно переводить на русский язык несколькими способами:

- Глаголом, оканчивающимся на –**ся, -сь, т.е. возвратным глаголом**
- Сочетанием глагола **быть** с краткой формой причастия страдательного залога (в русском языке в

этом сочетании глагол **быть** в настоящем времени не употребляется).

- Глаголом в активном залоге в 3-м лице множественного числа в составе неопределенно-личного предложения.

Дополнение в предложении с глаголом-сказуемым в страдательном залоге употребляется с предлогом **by** или **with**. Это дополнение соответствует русскому дополнению в творительном падеже без предлога.

Дополнение с предлогом **by** выражает действующее лицо или действующую силу:

The fish **was caught by** the seagull. – *Рыба была поймана чайкой.*

Дополнение с предлогом **with** выражает орудие действия:

Plants **are cut with** scissors. – *Растения обрезают ножницами.*

Особенности перевода страдательного залога глаголов с предлогами

to agree upon	Договориться о чем-либо
to arrive at	Прийти к соглашению
to insist on	Настаивать на
to deal with	Иметь дело
to listen to	Слушать
to look at	Смотреть на
to laugh at	Смеяться над кем-либо, над чем-либо
to look after	Присматривать

to resort to	Прибегать
to rely on (upon)	Полагаться на
to send for	Послать за кем-либо
to speak (talk) of, about	Говорить о ком-либо, о чём-либо
to think of	Думать о чем-либо, о ком-либо
to refer to	Ссылаться на
to account for	Объяснять
to approve of	Одобрять
to bring about	Вызвать что-либо
to comment on (upon)	Комментировать что-либо
to be faced with	Сталкиваться с чем-либо
to touch on (upon)	Затрагивать что-либо (проблему, вопрос)

Обратите особое внимание на следующие глаголы без предлогов, которые часто употребляются в страдательном залоге: **to follow, to answer, to replace, to attend, to influence.**

1. The seminar was attended by all the students of the group
2. He was greatly influenced by other people`s opinions.
3. The summit meeting was followed by a press-conference.

To attend	Посещать
To follow	Следовать за
To replace	Заменять

To influence	Оказывать влияние, воздействие
To join	Присоединяться
To answer	Отвечать

Now, practice:

Translate the sentences into Russian.

1. Some plants are quickly affected by cold.
2. The symposium was attended by twenty biologists.
3. The problem of pollution was not even touched on some fifty years ago.
4. This date of their visit will be insisted on.
5. Some of the data obtained cannot be relied upon, others have not been published yet.
6. The quality of the instruments used can be safely relied upon.
7. The research was followed by the discovery.
8. The articles written by this well-known scientist are often referred to in all recent publications.
9. This is certainly a great inconvenience, but it must be put up with.
10. After a long and heated discussion, the compromise was arrived at.
11. The ancient cult of trees is also alive in England. In public parks, villages, old trees are looked after and cherished.
12. The zoo is being reconstructed now.
13. The lectures of this famous professor are always listened to with great attention.

14. The changes taking place are not easily accounted for.
15. His remarks were taken no notice of.
16. The discussion was put an end to by his sudden arrival.

III. Translate from English into Russian paying attention to the Passive Constructions:

1. Such trifles should be put up with.
2. Another interesting effect was observed during the experiment.
3. This experiment is never spoken about.
4. After a long discussion an agreement was arrived at.
5. The demonstration of the experiment was followed with great attention.
6. The symposium should be attended by many biologists.
7. The problem had already been dealt with before we came to the seminar.
8. Such results are not to be wondered at.
9. His presence was taken no notice of.
10. The student is not spoken to.
11. In the Biology Institute English is paid great attention to.
12. This colleague is not to be relied upon.
13. They were not allowed to carry out the experiment.
14. The laboratory was not worked in.
15. Very important problems are being discussed at the scientific conference.

Неличные формы глагола: инфинитив, причастие, герундий

Следующие глаголы требуют употребления после себя инфинитива:

To agree, to ask to intend, to learn to decide, to manage, to deserve, to offer, to fail, to plan, to forget, to prepare, to hope, to refuse, to expect, to want.

E.g. He deserves to be awarded a golden medal for his work in this area of science.

The student expected to get all information he needs.

They managed to conduct the experiment successfully.

Использование герундия после глаголов с предлогами, а также после некоторых глагольных словосочетаний:

To accuse of, to agree to, to approve of, to depend on, to feel like, to insist on, to object to, to persist in, to prevent from, to rely on, to speak of to suspect of, to think of, to give up the idea of, to look forward to.

Следует обратить особое внимание на следующие словосочетания, после которых употребляется герундий:

Cannot help – нельзя + не + Infinitive.

E.g. They couldn`t help using this information. – *Они не могли не использовать эту информацию.*

It is worth (it is worthwhile) – стоит + Infinitive или существительного.

E.g. It is worth (worthwhile) discussing this rare phenomenon. –

Стоит обсудить это редкое явление.

Do you mind + притяжательное местоимение + герундий.

E.g. Do you mind my asking you one or two more questions? –

Вы ничего не имеет против того, чтобы я задал ещё вам один-два вопроса?

They could not help discussing such events before going to the conference. – *Они не могли не обсудить такие события, прежде чем отправиться на конференцию.*

It is worth discussing a number of issues at the coming scientific conference. – *Стоит обсудить ряд вопросов на предстоящей научной конференции.*

Некоторые случаи использования активной и страдательной формы герундия:

	Active	**Passive**
Indefinite	keeping	being kept
Perfect	having kept	having been kept

Следует отметить, что существует ряд слов, после которых используется активная форма герундия. Это глаголы: to need, to want, to deserve, to require.

E.g. This laboratory equipment needs fixing. – *Это лабораторное оборудование нуждается в ремонте.*

This interesting scientific paper is worth reading and discussing. – *Эта интересная научная работа достойна прочтения и обсуждения.*

This text needs revising. – *Этот текст нуждается в доработке.*

Причастие настоящего времени (*Participle I*) и причастие прошедшего времени (*Participle II*)

Asking – активная форма Been asked – страдательная форма

Having asked – активная форма (совершенного вида)

Having been asked – страдательная форма (совершенный вид)

The fence surrounding the garden is newly painted. – *Забор, окружающий сад, недавно покрашен.*

When working in his study he does not like to be disturbed. – Когда он работает в своем кабинете, он не любит, когда его беспокоят.

Drug abuse is increasing with alarming rate. – Злоупотребление наркотиками растет с угрожающей скоростью.

People are alarmed by drug abuse increasing rate. – *Люди встревожены растущим уровнем злоупотребления наркотиками*

Exercises

I. Define the functions of the non-finite forms of the verbs and translate the sentences into Russian:

1. To get high yields of crops, we must know how a plant grows.
2. Each flowering plant has leaves.
3. The main factor affecting the viability of seeds is their moisture content.
4. Generally speaking, I do not like his manner of teaching students in such a way.
5. Agronomists have agreed that farmyard manure is desirable or even essential to maintain or to improve soil fertility.
6. Today, a new system of growing plants and fertilization is making headway.
7. The remains of plant crops and leaves are converted into soluble compounds by soil organisms.
8. We know of the work having been carried out in this laboratory.
9. In spite of being complicated the problem has been solved.

II. Translate the following sentences into English:

1. Живые организмы, образующие малые органические молекулы, или мономеры, заслуживают упоминания в этой научной статье.
2. Проблема происхождения видов до сих пор требует глубокого исследования.
3. Крахмал можно расщепить на молекулы глюкозы при помощи ферментов.
4. Полученный от родителей новый набор генов, способствующих лучшему выживанию, начинает преобладать в популяции.
5. Несмотря на свою занятость, профессор помог нам успешно провести этот эксперимент.
6. Научный руководитель попросил аспиранта усовершенствовать свой план.
7. Имена этих ученых, работающих в области биологии, заслуживают упоминания.

Особенности инфинитива и инфинитивных оборотов

Формы инфинитива

	Active	***Passive***
Indefinite	to break	to be broken
Continuous	to be breaking	-
Perfect	to have broken	to have been broken
Perfect Continuous	to have been breaking	-

Функции Инфинитива в английском предложении:

Инфинитив – подлежащее – To make a choice is rather difficult.

It is rather difficult to make a choice.

Инфинитив – дополнение – We found it difficult to help him.

They asked us to go there as soon as possible.

Инфинитив – определение – The Dean of the faculty was the first to confirm this information.

The examples to be found in this paper are of great interest.

Инфинитив – часть сказуемого – They must complete the experiment by all means.

Our aim is to pass our English exam successfully.

Инфинитив – обстоятельство – The subject is fascinating enough to be discussed.

This student is too smart to present his ideas to the audience clearly.

Инфинитив как вводная часть предложения:

To tell the truth;
To begin with;
To sum up;
To say nothing of;
To put it simply;
To put it briefly;
To put it another way.

E.g. To put it briefly, the work must be done just in time. – *Короче говоря, работа должна быть сделана точно в срок.*
To tell the truth, we have got quite different results of the experiment. – *По правде говоря, мы получили совсем другие результаты эксперимента.*

Объектная конструкция с инфинитивом

(The Objective-with-the-Infinitive Construction)

E.g. They want us to become good biologists. – *Они хотят, чтобы мы стали хорошими биологами.*

He heard them discuss the results of their experiment. – *Он слышал, как они обсуждали результаты своего эксперимента.*

They find the experience of this conference to have been a remarkable one. – *Они считают, что опыт этой конференции был замечательным.*

Субъектная конструкция с инфинитивом

(The Subjective Infinitive Construction)

They are said to be good specialists in this field of biology. – *Говорят, что они хорошие специалисты в этой области биологии.*

He seems to know little about research work. – *Кажется, он мало разбирается в исследовательской работе.*

They are likely to arrive in the morning. – *Скорее всего, они прибудут утром.*

He is unlikely to pass his exam very well. – *Он вряд ли сдаст экзамен очень хорошо.*

Глаголы, которые употребляются в the Subjective-with-the-infinitive Construction в страдательной форме:

to believe, to think, to consider, to hold, to assume, to suppose, to expect, to say, to report, to estimate etc.

The for-to-Infinitive Construction

It is necessary for you to make the experiment once more and present all data to the research adviser. – *Вам необходимо провести эксперимент еще раз и предоставить все данные научному руководителю.*

For the experiment to be successful the post graduates had to do much work. – *Чтобы эксперимент удался, аспирантам пришлось проделать большую работу.*

Exercises

I. Define the function(s) of the Infinitive and translate the following sentences from English into Russian:

1. To conduct an experiment of this kind seems nearly impossible.

2. The article is too brief to bring out all the important areas of modern genetics.

3. Our task is to participate in the International scientific conference to be held next month.

4. To be sure, all solutions to the problem should be taken into consideration.

5. The head of the department was the first to inform us concerning this matter.

6. He failed to make his point of view clear and each of us was dissatisfied with such a state of things.

7. They managed to get in touch with the other colleagues to solve this problem.

8. These are the measures to be urgently taken.

9. I was glad to have met you at the symposium.

10. This student is disappointed not to have been included in the research team.

11. By his great presence of mind, he managed to avoid such terrible results of the experiment.

12. To separate this virus from the many inactive components, two stages of centrifuging were employed.

II. Find the Infinitive constructions in the following sentences and translate them adequately:

1. No efforts are large enough for the research to be completed.

2. Prof. Strogov was the first to raise that question at the meeting.

3. They thought them to be honored by the invitation to the international congress.

4. This scientist supposes this phenomenon to be quite a rare one.

5. All our efforts proved (to be) useless.

6. The participants are reported to have already arrived at the conference hall.

7. They are likely to participate in this international conference.

8. He is unlikely to come here just in time and warn us about the coming situation.

9. What we want is for you to understand the matter clearly.

10. Prof. P.N. Krylov is considered to have been one of the most outstanding scientists of Tomsk University.

Appendix

Неправильные глаголы

Infinitive	Past Simple	Past Participle	Перевод
arise	arose	arisen	появляться
awake	awoke	awoken	просыпаться, будить
be	was, were	been	быть
bear	bore	born(e)	нести
beat	beat	beaten	бить, побеждать
become	became	become	становиться
begin	began	begun	начинать
bend	bent	bent	гнуть, поворачивать
bind	bound	bound	связывать
bite	bit	bitten	кусать
bleed	bled	bled	кровоточить
blow	blew	blown	дуть
break	broke	broken	ломать
bring	brought	brought	приносить
build	built	built	строить
burn	burnt, burned	burnt, burned	гореть
burst	burst	burst	лопаться, рваться
buy	bought	bought	покупать
catch	caught	caught	ловить
choose	chose	chosen	выбирать
come	came	come	приходить

cost	cost	cost	стоить
creep	crept	crept	ползать
cut	cut	cut	резать, стричь
deal	dealt *[delt]*	dealt *[delt]*	распределять иметь дело
do	did	done	делать
drink	drank	drunk	пить
drive	drove	driven	вести машину
eat	ate	eaten	есть
fall	fell	fallen	падать
feed	fed	fed	кормить
feel	felt	felt	чувствовать
fight	fought	fought	драться
find	found	found	находить
flee	fled	fled	убегать
fly	flew	flown	летать
forbid	forbade	forbidden	запрещать
forget	forgot	forgotten	забывать
freeze	froze	frozen	замерзать
get	got	got	получать
give	gave	given	давать
go	went	gone	идти
grow	grew	grown	расти
hang	hung	hung	вешать
have	had	had	иметь
hear	heard	heard	слышать
hide	hid	hidden	прятаться

hit	hit	hit	бить
hold	held	held	держать
hurt	hurt	hurt	ранить
keep	kept	kept	хранить
know	knew	known	знать
lay	laid	laid	класть
lead	led	led	вести
lean	leant *[lent]*, leaned	leant *[lent]*, leaned	наклонять
learn	learnt, learned	learnt, learned	учить
leave	left	left	уходить, оставлять
lend	lent	lent	одалживать
let	let	let	позволять
lie	lay	lain	лежать
light	lit, lighted	lit, lighted	освещать
lose	lost	lost	терять
make	made	made	делать
mean	meant *[ment]*	meant *[ment]*	иметь в виду
meet	met	met	встречать
pay	paid	paid	платить
put	put	put	класть
quit	quit, quitted	quit, quitted	выходить, бросать
read	read *[red]*	read *[red]*	читать
ride	rode	ridden	ехать
ring	rang	rung	звонить
rise	rose	risen	восходить

run	ran	run	бежать
say	said *[sed]*	said *[sed]*	говорить
see	saw	seen	видеть
seek	sought	sought	искать
sell	sold	sold	продавать
send	sent	sent	отправлять
set	set	set	ставить
shake	shook	shaken	трясти
shine	shone	shone	светить
show	showed	shown, showed	показывать
shrink	shrank, shrunk	shrunk	сжиматься, усыхать
shut	shut	shut	закрывать
sink	sank	sunk	тонуть
sit	sat	sat	сидеть
sleep	slept	slept	спать
slide	slid	slid	скользить
smell	smelt, smelled	smelt, smelled	пахнуть
speak	spoke	spoken	говорить
speed	sped	sped	спешить
spell	spelt, spelled	spelt, spelled	произносить
spend	spent	spent	тратить
spill	spilt, spilled	spilt, spilled	проливать
spin	spun	spun	крутить
spit	spat	spat	плевать
split	split	split	разбивать
spoil	spoilt, spoiled	spoilt, spoiled	портить

spread	spread	spread	распространять
spring	sprang	sprung	вытекать
stand	stood	stood	стоять
steal	stole	stolen	красть
stick	stuck	stuck	втыкать
sting	stung	stung	жалить
stink	stank, stunk	stunk	вонять
strike	struck	struck	бить
sweep	swept	swept	выметать
swim	swam	swum	плавать
swing	swung	swung	качать, вертеть
take	took	taken	брать
teach	taught	taught	обучать
tear	tore	torn	рвать
tell	told	told	говорить
think	thought	thought	думать
throw	threw	thrown	кидать
understand	understood	understood	понимать
wake	woke	woken	просыпаться, будить
wear	wore	worn	носить
weep	wept	wept	плакать
win	won	won	побеждать
wind *[waind]*	wound *[waund]*	wound *[waund]*	изгибаться
write	wrote	written	писать

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