PRIVATE HIGHER EDUCATIONAL ESTABLISHMENT
"KYIV MEDICAL UNIVERSITY"

«APPROVED»
Head of Admission Committee
of PHEE "Kyiv Medical University"
Rector _____ B. IVNYEV
«18» 03 2025

THE PROGRAM

of the admission examination (writing test) in Biology
for foreign citizens and stateless persons
aimed at obtaining the master's degree
in the fields of science I "Health care and social services"
in the following specialties
I2 "Medicine", I1 "Dental studies",
I8 "Pharmacy"

Kyiv 2025

INTRODUCTION

The program of entrance examination (writing test) on the discipline "Biology" for foreigners and stateless persons who plan further study at the Private Higher Educational Establishment "Kyiv Medical University" aimed at obtaining the master's degree in the field of science I "Health care and social services" majors I1 «Dental studies», I2 «Medicine» and I8 «Pharmacy», designed concerning the content and scope of basic curricula and requirements for the graduates of general secondary education level.

The program is designed for PHEE «Kyiv Medical University» applicants.

The program of entrance exam (writing test), the structure of tests, assessment criteria, the procedure of assessing the readiness, knowledge and skills for applicants had been elaborated and approved at the meeting of the Admissions Committee of PHEE «Kyiv Medical University» from _____, Protocol № ___.

THE PURPOSE OF THE EXAMINATION TESTING

The main purpose of the testing is to obtain complete objective information about the state of training of potential students of Kyiv Medical University in the discipline "Biology" and to assess the level of their knowledge and skills.

PROGRAMME CONTENT

The materials of the Biology programme include the following sections:

> "Introduction. Chemical composition, structure and functioning of cells. Implementation of hereditary information"; "Structure and functioning of eukaryotic cells"; "Metabolism and energy conversion"; "Preservation and implementation of hereditary information".

> "Patterns of heredity and variability"; "Selection of organisms. Biotechnology";

> "Biodiversity"; "Systematics - the science of the diversity of organisms"; "Viruses"; "Viroids"; "Prions"; "Prokaryotic organisms"; "Algae"; "Plants. Vegetative organs and vital functions of plants"; "Generative organs of angiosperms"; "Diversity of plants. Reproduction of plants"; "Fungi"; "Lichens"; "Unicellular heterotrophic eukaryotic organisms"; "Sponges"; "True multicellular animals. General features of structure and vital processes"; "Animal behaviour"; "Diversity, distribution, importance of animals".

> "The human body as a biological system"; "The human body as a biological system"; "Structure of the human body"; "Nervous regulation. Human nervous system"; "Humoral regulation. Human endocrine system"; "Internal environment of the human body. Blood. Lymph"; "Human circulatory and lymphatic systems"; "Immunity. Human immune system"; "Breathing. Human respiratory system"; "Digestion. The human digestive system"; "Metabolism and energy conversion in the human body"; "Excretion. Human urinary system"; "Skin. Thermoregulation"; "Human musculoskeletal system"; "Human sensory systems"; "Higher nervous activity of the human body"; "Human reproduction and development".

> "Fundamentals of ecology and evolutionary doctrine".

> "Ecological factors. Population"; "Ecosystems"; "Biosphere as a global ecosystem"; "Adaptation as a general property of biological systems"; "Fundamentals of evolutionary doctrine".

Requirements for knowledge and skills at the level of general education of applicants

> know the basic methods of scientific knowledge;

> know the basic provisions of biological laws, rules, theories, regularities, hypotheses;

> know the essence of biological processes and phenomena;

> know the structure and characteristics of biological objects;

> know modern biological terminology and symbols;

> be able to explain, make connections, draw up diagrams, obtain information from tabular data and graphical representations;

> be able to recognise biological objects by their images;

> be able to establish cause and effect, functional, structural relationships in living nature;

> be able to compare life processes at different levels of organisation: molecular, cellular, organismal, population-species, ecosystem, biosphere and identify relationships between them;

> to be able to classify, analyse, compare and draw conclusions to use knowledge in everyday life (to justify the rules of behaviour in the environment, disease prevention measures, methods of providing first aid);

> be able to identify the consequences of the impact of bad habits on the body;

> be able to justify conclusions.

No.	Title of the thematic section	Content of the material	Requirements for the level of general education of applicants

p/n			
1.1	**Introduction. Chemical composition, structure and functioning of cells. Implementation of hereditary information. Introduction**	Fundamental properties of the living. Levels of organisation of life in biological systems and their characteristics. Methods of research in biology. The importance of biological research in human life.	TO KNOW AND UNDERSTAND Fundamental properties and functions of the living. Levels of life organisation of biological systems: molecular, cellular, organismal, ecosystem, biosphere. Research methods in biology: comparative and descriptive, experimental, modelling, monitoring. Meaning of concepts and terms: system, biosystem, modelling, monitoring. BE ABLE TO. Determine the correct application of these concepts and terms. Distinguish between levels of organisation of life in biological systems by their characteristics. Draw up a research plan. Choose a research method. Determine the purpose, conditions of research, necessary equipment, sequence of experiments. Analyse the results of biological experiments, which can be presented in the form of descriptions, tabular information, graphs, diagrams, etc.
1.2	**Chemical composition of the cell**	Classification of chemical elements according to their content in organisms. Consequences of insufficient or excessive intake of chemical elements (I, F, Fe, Ca, K) in the human body and ways to eliminate their deficiency. Organic and inorganic compounds and their role in the body. Water, its basic properties and role in the body. Water as a solvent, hydrophobic and hydrophilic compounds. Biopolymers: the concept of their structure and conformation. Carbohydrates: monosaccharides (ribose, deoxyribose, glucose, fructose), oligosaccharides (sucrose, lactose), polysaccharides (starch, cellulose, chitin, glycogen). Basic properties and functions of carbohydrates in organisms. Lipids (fats, waxes, steroids, phospholipids). Basic properties and functions of lipids in organisms. Proteins. Amino acids as monomers of proteins. Levels of structural organisation of proteins. Denaturation and renaturation of proteins. Basic biological functions of proteins. Enzymes, their properties and principles of functioning. Nucleic acids. Structure of nucleotides. Structure and function of DNA. The principle of complementarity. Nucleotide sequence and the concept of a gene. Properties of DNA. RNA and its	KNOW AND UNDERSTAND Macronutrients, including organogenic elements. The biological role of water, oxygen, Na^+, K^+, Cl^-, Ca^{2+}, Mg^{2+} ions. Structure, basic properties and functions of proteins, carbohydrates, lipids (for example, fats and phospholipids), nucleic acids, ATP. Features of the spatial organisation of proteins, nucleic acids, polysaccharides (starch, cellulose). The role of chemical bonds (covalent, ionic, hydrogen), hydrophobic interaction in the structural organisation of macromolecules. Properties and principles of enzyme functioning. The role of ATP in energy supply. Meaning of concepts and terms: biopolymer, monomer, macronutrients, organogenic elements, trace elements, hydrophilic and hydrophobic compounds, denaturation, renaturation, replication, enzymes, coenzymes, active site of the enzyme, conformation, principle of complementarity, gene, macroergic connection, endemic diseases. BE ABLE TO. Determine the correct application of these concepts and terms. Distinguish between: macronutrients (including organogenic elements) and trace elements, levels of protein structural organisation (primary, secondary, tertiary, quaternary structure), globular and fibrillar proteins, types of RNA (mRNA, rRNA, tRNA). Establish the relationship between physical and chemical properties and the biological role of water. Compare DNA and RNA in terms of chemical composition and structure. Suggest measures to prevent human diseases that occur under conditions of excess or deficiency of chemical elements (I, F, Fe, Ca, K) in the human body or in the environment. Solve elementary exercises in molecular biology: determine the molecular weight of a substance (protein, nucleic acid) by the mass of one of its components, the length

		types (mRNA, rRNA, tRNA). ATP. The role of ATP in energy supply.	of a nucleic acid molecule, and its composition.
1.3	**Structure and function of eukaryotic cells**	Cell as an elementary unit of life. Methods of cell research. Basic properties and principles of eukaryotic cell structure. Cell membranes, their chemical composition, structure, properties and main functions. Transport of substances through cell membranes. Cytoplasm, its components: cytoskeleton, organelles and inclusions. Single-membrane organelles: endoplasmic reticulum, Golgi apparatus, lysosomes, vacuoles. Double-membrane organelles: mitochondria, plastids (chloro-, leuco- and chromoplast). Mitochondria: structure, functional role. Chloroplasts: structure, functional role of chloroplasts. Autonomy of mitochondria and chloroplasts in the cell. Ribosomes: structure, functional role. Centrioles. Organelles of movement (flagella, cilia). Nucleus: structure, functional role. Chromosomes: chemical composition, structure, functional role. Haploid and diploid sets of chromosomes. Homologous chromosomes. Main states of chromosomes: interphase noncompact and supercompactation in the process of cell division. Duplication of chromosomes due to DNA replication. Morphology of supercompact /mitotic/ chromosomes. The concept of karyotype. Nucleus, its functional role.	TO KNOW AND UNDERSTAND Methods of cell research: microscopy (light, electronic), differential centrifugation. Structure and function of cell components. Chemical composition of the cell membrane. The role of membranes in cellular interaction. Mechanisms of transport of substances across membranes. Features of the organisation of eukaryotic cells. Basic states of chromosomes. The role of the nucleus in the storage, transmission and implementation of hereditary information. The importance of karyotype stability for the existence of the species. Reasons for differences in the structure of cells of plants, animals, fungi. Meaning of concepts and terms: eukaryotes, active and passive transport of substances across the membrane, endocytosis (phagocytosis, pinocytosis), exocytosis, plasmolysis, deplasmolysis, cristae, thylakoids, lamellae, matrix, stroma, cytoplasm, plasmodesmata, organelles, inclusions, karyoplasm, chromosomes, homologous chromosomes, haploid and diploid chromosome sets, chromatin, nucleosome, centromere, chromosome arms, karyotype. BE ABLE TO. Determine the correct application of these concepts and terms. Describe the cell as an elementary unit of life. Visually recognise plant and animal cells and their components. Establish a connection between the structure and functions of cell components. Distinguish between: active and passive transport of substances across the membrane, exo- and endocytosis, phage and pinocytosis; haploid and diploid sets of chromosomes; states of chromosomes. Compare the organisation of plant, fungal and animal cells.
1.4	**Metabolism and energy transformation**	Metabolism, its general characteristics. Unity of processes of synthesis and breakdown of substances in the body. Autotrophic and heterotrophic types of nutrition. Mixotrophic organisms. Breakdown of substances in the body (oxygen-free, oxygen). The concept of glycolysis, fermentation. The concept of cellular respiration. Mitochondrion as an energy station of the cell. Photosynthesis. The main processes that occur in light- dependent and light-independent reactions /light and dark phases/ of photosynthesis. The role of chlorophyll in light-dependent	TO KNOW AND UNDERSTAND The essence and significance of: anabolism, catabolism; preparatory stage of organic matter breakdown; glycolysis; fermentation; oxygen stage of organic matter breakdown; photosynthesis; chemosynthesis. The role of enzymes in metabolic processes. Energy sources for photo-, chemo- and heterotrophic organisms. Sources of carbon for auto- and heterotrophic organisms. Sources of organic matter for heterotrophic organisms. Examples of autotrophic (photosynthetics: cyanobacteria, algae, plants; chemosynthetics: iron bacteria, sulphur and nitrifying bacteria), heterotrophic and mixotrophic (euglena green, insectivorous plants) organisms. Meaning of the concepts and terms: metabolism, anabolism, catabolism, autotrophic organisms, phototrophic organisms, chemotrophic organisms, heterotrophic

		reactions /light phase/ of photosynthesis. The importance of photosynthesis for the existence of the biosphere. The concept of chemosynthesis.	organisms, mixotrophic organisms, photosynthesis, chemosynthesis, glycolysis, fermentation, cellular respiration, Krebs cycle, respiratory chain. BE ABLE TO. Determine the correct application of these concepts and terms. Classify organisms according to the source of energy; carbon; organic matter. Write summary equations of photosynthesis and respiration. Compare: respiration and photosynthesis; fermentation and respiration. Analyse the chemical and energetic results of: the stages of splitting organic compounds (preparatory, oxygen-free, oxygen); light-dependent /light phase/ and light-independent /dark phase/ reactions of photosynthesis.
1.5	**Preservation and realisation of hereditary information**	Genes, their structure and functional role. Mosaic structure of the eukaryotic gene (exons and introns). The concept of the genome. Transcription: matrix synthesis of RNA molecules. The concept of transcription regulation. Biosynthesis of proteins (translation). Genetic code and its basic properties. The role of mRNA, tRNA and ribosomes in protein biosynthesis. DNA replication: semi-conservative principle. The concept of DNA repair. DNA replication and the cell cycle. Interphase and cell division. The number of DNA molecules and chromosomes at different stages of the cell cycle. Mitosis, the main processes that occur during mitosis. Meiosis and its features in comparison with mitosis. Functional role of meiosis. The concept of DNA recombination during meiosis. Crossover. Formation of gametes and their union into a zygote during fertilisation. Sexual reproduction. The main forms of asexual reproduction of organisms (division by mitosis, budding, spore reproduction, vegetative reproduction). Individual development of an organism (ontogeny). Embryonic development. The main stages of embryonic development in chordates (zygote division, formation of blastula and gastrula). The phenomenon of embryonic induction. The concept of cell differentiation during embryonic development. Stem cells. Post-	TO KNOW AND UNDERSTAND The structure of the gene. Features of the organisation of the genome of pro- and eukaryotes. The role of enzymes in ensuring the processes of transcription and translation. Methods of transcription regulation on the example of the lactose operon of prokaryotes and alternative splicing of eukaryotes. The essence and biological significance of: biosynthesis of proteins and nucleic acids; mitosis, meiosis, crossover; sexual and asexual reproduction, parthenogenesis, polyembryony, fertilisation; alternation of generations in the life cycle of organisms of direct and indirect animal development. Stages of embryonic development in animals (division, formation of morula, blastula, gastrula, cell differentiation, histogenesis, organogenesis), the phenomenon of embryonic induction. Biological significance of reproduction. Meaning of concepts and terms: heredity, variability, gene, genome, exons, introns, transcription, translation, genetic code, interphase, cell cycle, DNA recombination, crossover, ontogeny, embryo, embryonic induction, blastula, gastrula, cell differentiation, fertilisation, gametes, zygote, mitosis, meiosis. BE ABLE TO. Determine the correct application of the above concepts and terms. Compare: mitotic and meiotic cell division; sexual and asexual reproduction; structure of male and female gametes; direct and indirect development of multicellular animals; possibilities and mechanisms of organism regeneration in plants and animals. Analyse: stages of the cell cycle; phases of mitosis and meiosis; stages of germ cell formation; periods of ontogeny in plants and animals. Identify the advantages of a particular form (method) of reproduction. Distinguish: methods of reproduction; forms of fertilisation; methods of vegetative reproduction of plants and animals. Classify the types of growth of organisms of different kingdoms. Visually recognise: a cell at different stages of mitotic division; an embryo at different stages of embryonic development. Solve elementary exercises on

		embryonic development in animals and its main types (indirect and direct).	replication, transcription, translation.
2.1	**Patterns of heredity and variation**	Genetics is the science of patterns of heredity and variability in organisms. Classical methods of genetic research. Basic concepts of genetics. Basic patterns of gene functioning in prokaryotes and eukaryotes.	TO KNOW AND UNDERSTAND Methods of genetic research (hybridological, genealogical, population and statistical, cytogenetic, biochemical, twin), their features and diagnostic value. Basic laws of gene functioning in prokaryotes and eukaryotes. Meaning of concepts and terms: allele, genotype, phenotype, dominant allele, recessive allele, homozygote, heterozygote, pure line, hybrid. BE ABLE TO. Determine the correct application of these concepts and terms. Distinguish between: alleles of the same and different genes; homozygotes and heterozygotes; genotypes and phenotypes; dominant and recessive states of traits. Identify situations in which it is appropriate to use a particular method of genetic research.
2.2	**Patterns of heredity in organisms**	The laws of heredity established by G. Mendel. A method of checking the genotype of hybrid individuals (analytical crossing). Multiple action of genes. A trait as a result of the manifestation of many genes. Interaction of genes. The linkage of inheritance. Chromosomal theory of heredity. Genetic basis of sex determination in different groups of organisms. Chromosomal sex determination. Sex-linked inheritance. Chromosomal analysis as a method of detecting abnormalities in the structure of the karyotype. Hereditary diseases and defects, human diseases with a hereditary predisposition, their causes. Modern molecular genetic methods of human heredity research.	KNOW AND UNDERSTAND The rule of purity of gametes. The laws of uniformity of first generation hybrids (dominance), and splitting, independent combination of traits, their statistical nature. The intermediate nature of inheritance (incomplete dominance). Codominance on the example of determining human blood groups. Cytological basis of the laws of heredity by G. Mendel. Causes of deviations in phenotypic splitting from the typical quantitative ratios established by G. Mendel. Types of interaction between alleles of the same and different genes. Mechanisms of sex determination. Causes of linked (including sex) inheritance. The main provisions of the chromosomal theory of heredity. Causes of human hereditary diseases. Modern molecular genetic methods of studying human heredity. Meaning of the concepts and terms: sex chromosomes, autosomes, homo- and heterogametic sex, analytical crossing, gene pool, hereditary diseases. BE ABLE TO. Distinguish between: types of interaction of alleles of one gene (complete dominance, incomplete dominance, codominance); types of inheritance of traits in humans (autosomal recessive, autosomal dominant, sex-linked). To determine: the distribution of phenotypes of offspring after crossing organisms with certain genotypes (and vice versa); possible genotypes for a given phenotype (and vice versa). Analyse: karyotypes, human genealogies; results of monohybrid and hybrid crosses and determine the type of inheritance of traits. Compare the effects of analysing crosses in independent and linked inheritance. Solve typical genetics problems on: monohybrid and hybrid crosses; interaction of alleles of one gene (complete and incomplete dominance, codominance); sex-linked inheritance. Justify: the integrity of the genotype; the importance of studying the laws of heredity for human

			practice.
2.3	**Patterns of variability in organisms**	Modification (nonhereditary) variability, its causes. The norm of reaction. Variation series and variation curve. Hereditary variability and its types: combinational and mutational. Sources of combinative variability. Mutations and their properties. Types of mutations (genomic, chromosomal, point, somatic and generative). Mutagenic factors (physical, chemical and biological).	KNOW AND UNDERSTAND Sources of combinational and mutational variability. Causes of modification variability. Causes of mutations. The role of the interaction of genotype and environmental conditions in the formation of the phenotype. Adaptive nature of modification changes. The importance of combinative variability. Properties of mutations. The importance of mutations in nature and human life. Patterns of combinative and mutational variability. Meaning of concepts and terms: combinational variability, modification variability, reaction rate, mutations, mutagenic factors. BE ABLE TO. Determine the correct application of these concepts and terms. Recognise hereditary and nonhereditary variability; types of hereditary variability. Distinguish: mutagenic factors; types of mutations. Compare: types of hereditary variability; mutational and modification variability. Analyse: a variation series and a variation curve. Justify: measures.
2.4	**Selection of organisms. Biotechnology**	The concept of plant variety, animal breed, microbial strain. Artificial selection (individual and mass). Related and unrelated crosses, interspecific (distant) hybridisation, their genetic and biological consequences. Heterosis and its genetic basis. The concept of basic methods and tasks of selection. Methods of molecular genetics as the basis of modern biotechnology: polymerase chain reaction, genetic engineering, DNA cloning, cellular engineering. Cloning of organisms. Genetically modified organisms (GMOs): principles of creation and areas of use.	TO KNOW AND UNDERSTAND Methods and tasks of breeding. Features of selection of plants, animals, microorganisms. The importance of: the laws of genetics for breeding; polyploidy in plant breeding. Biological significance of the phenomenon of heterosis. Causes of heterosis. Ways to overcome sterility of interspecific hybrids. Principles of creation and use of genetically modified and chimeric organisms. Areas of research and modern achievements of biotechnology. Meaning of concepts and terms: variety, breed, strain, artificial selection, hybridisation, inbreeding, outbreeding, heterosis, cloning, clone, genetically modified organisms, chimeras. BE ABLE TO. Determine the correct application of the specified concepts and terms. Distinguish between: forms of artificial selection, systems of crossing organisms. Determine genetic consequences of different systems of crossing organisms. Predict the consequences of the use of modern biotechnology. Evaluate the benefits and possible risks of using genetically modified organisms.
3.1	**Biodiversity** **Systematics is the science of the diversity of organisms**	The biodiversity of our planet is a consequence of evolution. Modern systematics of the organic world (domains: Archaea, Bacteria, Eukaryotes). The main taxonomic units used in the taxonomy of organisms. Species as the basic systematic unit. Biological concept of species. Modern criteria of the species. The concept of phylogenetic systematics. Methods of graphically displaying the relationship of systematic groups of	TO KNOW AND UNDERSTAND The modern system of the organic world. Modern principles of scientific taxonomy of organisms. Basic taxonomic units. The principle of hierarchy of taxa in taxonomy. The principle of double names of organisms. The essence of the biological concept of species. Modern criteria of the species. Meaning of concepts and terms: biodiversity, domain, taxonomic unit, systematics, nomenclature, classification, species, taxon, phylogeny, phylogenetic systematics, monophyletic group, cladogram, phylogenetic tree. BE ABLE TO.

		organisms.	Define: the correct application of these concepts and terms; the taxonomic position of a species in the system of the organic world. Analyse graphical representations of the relationship of systematic groups of organisms. Determine the level of relatedness of species based on the analysis of their karyotypes.
3.2	**Viruses. Viroids. Prions**	Features of the organisation and functioning of viruses. Hypotheses of the origin of viruses. The role of viruses in evolution, the concept of horizontal gene transfer. Ways of penetration of viruses into plant, animal and human organisms. Interaction of viruses with the host cell. The use of viruses in genetic engineering and biological methods of pest control. Prevention of human viral diseases. The concept of vaccination. The concept of viroids, prions.	KNOW AND UNDERSTAND Chemical composition, structure and reproduction of viruses. Mechanisms of penetration of viruses into human, animal, plant and bacterial organisms. Ways of virus exit from the cell. Effect of the virus on the host cell. Examples of human diseases caused by viruses (polio, influenza, AIDS, hepatitis, encephalitis, measles, mumps, SARS). Meaning of the concepts and terms: viruses, capsid, supercapsid, viroids, prions, vaccination, biological control. BE ABLE TO. Determine the correct application of these concepts and terms. Visually recognise and characterise bacteriophages, adenoviruses, tobacco mosaic viruses, influenza, human immunodeficiency viruses. Justify measures for the prevention of human viral diseases, the need for global control of human, animal and plant viral infections in modern conditions. Assess the prospects for the use of viruses in biotechnology.
3.3	**Prokaryotic organisms**	Structure of a prokaryotic cell. Prokaryotic organisms (archaea, bacteria), features of their organisation and functioning. Types of nutrition (photo- and chemosynthesis, heterotrophic) and respiration (anaerobic and aerobic) of prokaryotic organisms. Reproduction (cell division and budding) and exchange of hereditary information (conjugation) in prokaryotic organisms. Relationships of prokaryotic organisms with other organisms (mutualism, commensalism, parasitism). The role of prokaryotes in nature and human life. Pathogenic bacteria and human diseases caused by them. Prevention and treatment of bacterial diseases.	KNOW AND UNDERSTAND The structure of a prokaryotic cell. Features of organisation, nutrition, respiration, reproduction of prokaryotic organisms. The importance of archaea and bacteria. Examples of bacteria (Escherichia coli, cholera vibrio, Staphylococcus aureus, cyanobacteria: spirulina, nostoc). Examples of human diseases caused by bacteria (sore throat, diphtheria, whooping cough, tuberculosis, cholera, typhoid, scarlet fever, botulism, salmonellosis, tetanus), ways of their transmission. Meaning of concepts and terms: prokaryotic organisms, nucleoid, conjugation, incision, mutualism, commensalism, parasitism, nitrification, denitrification, nitrogen fixation. BE ABLE TO. Determine the correct application of the above concepts and terms. Visually recognise the forms of bacteria. Distinguish between archaea and bacteria. Compare the structure of pro- and eukaryotic cells. Identify the type of relationships between prokaryotes and other organisms. Justify measures for the prevention and treatment of bacterial diseases. Evaluate the prospects of using bacteria in biotechnology.
3.4	**Algae**	Features of the structure and life processes of unicellular and multicellular algae. Representatives of algae: Green algae (Chlamydomonas, Chlorella, Ulothrix, Spirogyra, Ulva), Diatoms (Pinularia, Navicula), Brown algae (Kelp, Fucus, Sargassum), Red	KNOW AND UNDERSTAND Features of the structure and life processes of green, diamond, brown, red algae. Distribution, diversity and importance of algae on the example of these representatives. Necessary conditions for the spread of algae. Meaning of the concepts and terms: zoospores, thallus/thallus, pyrenoid.

		algae (Porphyra, Phyllophora, Corallina).	BE ABLE TO. Determine the correct application of these concepts and terms. Visually recognise and characterise the specified types of algae. Explain the structural features of algae as a result of adaptation to the environment.
3.5	**Plants. Vegetative organs and vital functions of plants**	Plant cells. The main groups of plant tissues: permanent - integumentary (skin, cortex), conductive (vessels, sieve tubes), basic (photosynthetic, storage, including endosperm, mechanical); generative - apical and lateral. General characteristics of plants. The importance of plants. Root. Types of roots (main, adventitious, lateral). Root system and its types (taproot, fibrous). Root zones and their functions. Internal structure of the root in the zone of root hairs. Modifications of the root (root crops, tuberous roots, respiratory, supporting, tenacious, aerial, sucker roots). Shoot, its main parts (node, internode, leaf axil). Types of shoots: erect, ascending, climbing, twisting, tenacious, creeping, creeping. A bud is a rudimentary shoot. Structure of a bud (scales, cone of growth, rudimentary leaves). Varieties of buds by location on the shoot (apical and lateral/axillary/), by structure (vegetative and generative/flowering/). Structure of the shoot: stem and leaves. Branching of the shoot, formation of the crown. Modifications of the shoot: underground (rhizome, underground stem tuber, bulb, corm) and aboveground (whiskers, antennae, aboveground stem tuber, thorns). Stem. Internal structure of a woody stem (heartwood, wood, cambium, bast, cork, core rays, annual rings). Leaf: external structure (leaf base, petiole, leaf blade, stipules), internal structure (main tissue - columnar and spongy, stomata, veins (wood, bast), cuticle, skin), functions. Leaf venation: parallel, arcuate, palmate, pinnate, forked. Leaf arrangement: alternate, opposite, ringed. Leaf modifications (antennae, spines, scales, insect trap leaves). Leaf fall. Vital functions of plants: nutrition (mineral, photosynthesis), respiration, transpiration.	TO KNOW AND UNDERSTAND Features of the structure of plant cells. Types of plant tissues, their structure and functions. Features that distinguish plants from other eukaryotic organisms. Functions of vegetative organs of plants. Features of the external and internal structure of vegetative organs of plants. Features of the structure of roots, underground modifications of the shoot. Biological significance of modifications of vegetative organs. The relationship between parts of the plant organism. Mechanisms that ensure the movement of substances through the plant. Features and importance in plant life of mineral nutrition, photosynthesis, respiration, transpiration, leaf fall. Conditions necessary for photosynthesis. Methods of transpiration regulation. Influence on the level of transpiration of the state of the atmosphere around the leaf, soil condition, size and number of leaves, number of stomata. Adaptations to reduce transpiration. Regulators of plant growth. Meaning of concepts and terms: vascular fibre bundle, cambium, xylem, phloem, upward and downward flow of substances, root pressure, leaf tension, phytohormones, phytoncides, evergreens. BE ABLE TO. Determine the correct application of these concepts and terms. Visually recognise and characterise: plant tissues, vegetative organs of plants; types of roots; types of root systems; modifications of roots; root zones; elements of the internal structure of the root in cross-section; elements of the shoot; types of branching of the shoot; types of shoots, shoot modifications; elements of the internal structure of a woody stem; elements of the external and internal structure of a leaf; types of venation and leaf arrangement; simple and compound leaves; petiolate and sessile leaves; axillary leaves; elements of the structure of a bud; types of buds. Compare: fibrous and taproot systems; generative and vegetative buds in structure and function; processes of photosynthesis and respiration in plants. Identify: the correspondence between cells and types of plant tissues; the relationship between the structure and functions of plant tissues; the relationship between the structure and functions of vegetative organs. Distinguish between: upward and downward flow of matter, growth and hygroscopic movements of plants. Explain: the reasons for the differences in plant cells; features of plant structure as a result of their adaptation to life on land. To prove the integrity of the plant organism.

		Movement of substances in the plant. Growth and development of plants. Plant movements (growth, hygroscopic). Regulation of vital functions in plants.	
3.6	**Generative organs of angiosperms**	Structure of a flower: pedicel; receptacle; stamen (anther, pollen nests, structure of pollen grains, stamen filament); sepals (calyx); petals (corolla); perianth; pistil (stigma, column, ovary (upper and lower) with germ sacs in seed embryos). Functions of a flower. Variety of flowers (unisexual and bisexual, naked, with a simple and double perianth). Flower formula. Inflorescence. Types of inflorescences (simple - raceme, cob, head, basket, shield, umbel, simple spike; complex - compound spike, panicle, compound shield, compound umbel). Pollination and its types (self-pollination and crosspollination). The main methods of cross-pollination (by wind, insects). Adaptations of plants to the method of pollination. Double fertilisation in flowering plants. Seed and fruit formation. Functions of seeds and fruits. Structure of a seed: skin with a hole, embryo (germinal root, subcotyledonary knee, cotyledon, scar). Structure of the fruit (three-layer wall and seed). Types of fruits: dry (achene, seed, nut, bean, pod, pod), juicy (simple - drupe, pumpkin, berry, pomegranate, apple; composite - drupe, strawberry, fruit; fruit. The dormant period and conditions for seed germination.	KNOW AND UNDERSTAND Structure and functions of a flower, seed, fruit. Biological significance: inflorescences, fruits, double fertilisation, pollination, seed dormancy. Features of structure: seeds of monocotyledonous and dicotyledonous plants; different types of fruits. Meaning of the concepts and terms: pollen tube, pollen trap, endosperm. BE ABLE TO. Visually recognise and describe: elements of the structure of a flower, seed; unisexual and bisexual flowers, naked, with a simple and double perianth; types of inflorescences; types of fruits. Distinguish between: bisexual, unisexual, sterile flowers; monoecious and dioecious plants; flowers with a simple and double perianth; simple and complex inflorescences; dry (open and closed) and juicy fruits; single-seeded and multi-seeded fruits. Analyse the formula of a flower. Establish relationships between the structure and functions of parts of a flower. Determine: the method of pollination by the structure of the flower; the method of fruit distribution by their structure.
3.7	**Diversity of plants. Reproduction of plants**	The concept of the plant life cycle (alternation of asexual and sexual generations). General characteristics, peculiarities of distribution, importance of mosses, bryophytes, horsetails, ferns, gymnosperms, and angiosperms. Diversity of plants: Mosses (polytrichum, marshlandia, sphagnum); Plaunas (selaginella, common lamb's-quarters, mace plaunus); Horsetails (horsetail, horsetail); Ferns (male shield, eagle's-eye, leafy, ostrich, salvinia); Graminaceae (ginkgo biloba, yew berry, thuja, cypress, pine, spruce, larch, juniper, cedar, velvicia	KNOW 1 UNDERSTAND Common features of plants of the specified groups (features of structure and reproduction, the predominant generation in the life cycle, its features). Influence of structural and reproductive features on plant distribution. Reasons for the dominance of angiosperms in the modern flora. Differences between monocotyledonous angiosperms. The importance of plants of these groups in nature and human life. Forms and methods of plant reproduction. Biological significance of vegetative reproduction of plants. Meaning of the concepts and terms: reproduction, life cycle, spore, sporophyte, gametophyte, sporangia, gametangia, archegonia, antheridia. BE ABLE TO. Determine the correct application of these concepts and

		marvelous, ephedra, sagittaria); Covered seeds (Cabbage / Cruciferous /: Chickweed, wild radish, cabbage, mustard, rapeseed; Rosaceae: strawberry, rosehip, rowan, apple, cherry; Legumes: Fopox, beans, clover, robinia/white acacia/, alfalfa; Solanaceae: petunia, nightshade, tobacco, potato, tomato, pepper; Asteraceae/Complexiferae: sunflower, dandelion, thistle, chamomile, cornflower; Onion: onion, garlic, wild garlic; Lily: tulip, snowdrop, lily; Cereals: corn, rice, wheat, rye, oats, reeds, wheatgrass). Forms and methods of plant reproduction.	terms. Visually recognise and characterise: the specified plant species; methods of vegetative propagation (cuttings, grafting, layering, root shoots, modified shoots). Distinguish: sexual and asexual generation of mosses, ferns, horsetails, plaunas; forms and methods of plant reproduction. Compare: sexual and asexual reproduction of plants; life cycle of plants that reproduce by spores and plants that reproduce by seeds; naked-seeded and covered-seeded plants by structure and reproduction features.
3.8	**Fungi**	General characteristics of fungi. Features of the structure and processes of life on the example of cap fungi, moulds and yeasts. Saprotrophs, parasites, symbiotrophs. The importance of fungi in nature and human life. Variety of mushrooms: cap mushrooms (butter mushroom, porcini mushroom, boletus, mushrooms, champignons, fly agaric, pale toadstool), moulds (mucor, penicillium, aspergillus), plant parasites (tinder fungi, powdery mildew, sooty mushrooms, ergot). The use of fungi in the food industry and pharmacology.	KNOW 1 UNDERSTAND Differences between fungi and plants and animals. Features of the structure of cap fungi, moulds, yeasts. The role of fungi in nature. Meaning of concepts and terms. Mycelium (fungal mycelium) hyphae, fruiting body, osmotrophic feeding, mycorrhiza, saprotrophs, symbiotrophs, BE ABLE TO. Determine the correct application of these concepts and terms; Visually recognise and characterise the structural elements of cap and mould fungi. Distinguish between: cap and mould fungi; cap fungi with tubular and lamellar hymenophores. Compare the principles of organisation, structural features and processes of life of fungi and other eukaryotic organisms. Identify the relationships of fungi with other organisms. Evaluate the possibilities of using fungi in human economic activity.
3.9	**Lichens**	Lichens are associations of true fungi with photosynthetic organisms (algae and cyanobacteria). Structure and peculiarities of lichens' life (nutrition, reproduction). Scaling (lecanora), leafy (parmelia), bushy (cladonia) lichens. The importance of lichens in nature and human life.	KNOW AND UNDERSTAND Features of lichen structure and nutrition. Methods of lichen reproduction. Reasons for the endurance of lichens. Meaning of the concepts and terms: lichen (thallus), rhizoids, soredia, isidia, bioindicators. BE ABLE TO. determine the correct application of these concepts and terms; visually recognise and characterise the specified types of lichens; distinguish between scaling, leafy, bushy lichens; homeomeric and heteromeric thalli.
3.10	**Single-celled heterotrophic eukaryotic organisms**	Free-living and parasitic species of unicellular heterotrophic eukaryotic organisms. Inhabitants of freshwater bodies: proteus amoeba, slipper infusoria. Features of the structure and vital processes (nutrition, respiration, excretion, osmoregulation, movement, irritability, reproduction, incest). Human parasites (dysentery	KNOW AND UNDERSTAND Habitats, methods of reproduction of unicellular heterotrophic eukaryotic organisms. Structure, signs and manifestations of life of the amoeba protea, infusoria slipper Differences between autotrophic and heterotrophic organisms. The meaning of the concepts and terms heterotrophs, cyst, contractile vacuoles, digestive vacuoles, pseudopods, cilia, vegetative nucleus, generative nucleus, final host, intermediate host.

		amoeba, malaria plasmodium) and their features. Diseases caused by parasitic unicellular organisms (amoebic dysentery, malaria) and their prevention.	BE ABLE TO. Determine the correct application of these concepts and terms. Visually recognise and characterise the specified unicellular heterotrophic organisms and elements of their structure. Justify measures to prevent diseases caused by parasitic unicellular organisms.
3.11	**Sponges**	Sponges are the primary multicellular animals at the pretissue level of organisation. Features of the structure and processes of life on the example of sponges. The role of sponges in nature and human life.	KNOW AND UNDERSTAND Features of the structure of the sponge body. Processes of nutrition, respiration, excretion, reproduction of sponges. The way of life of sponges. Meaning of concepts and terms: mesoglea. BE ABLE TO. Determine the correctness of the application of these concepts and terms. Visually recognise elements of the structure of the sponge body. Distinguish between types of sponge cells.
3.12	**Real multicellular animals. Common features of structure and life processes**	Tissues of animals. Types of body symmetry (bilateral, radial). Types of body cavity (primary, secondary, mixed). Body integument. Organ systems: musculoskeletal system (external and internal skeleton, hydroskeleton, muscles), digestive system (closed and through intestine, digestive glands), circulatory system (closed, open), nervous system (diffuse, ganglionic, tubular), variety of respiratory organs (gills, trachea, lung sacs, lungs) and excretion (kidneys, malpighian vessels, metanephridia, protonephridia). Sensory organs. Sensitivity and movement. Forms of animal reproduction. Sex cells, fertilisation. Development of animals.	TO KNOW AND UNDERSTAND Features of the organisation of the animal body. Organs, organ systems of animals and their functions. Variety of body covers, respiratory organs, secretions, sensory organs of animals. Forms of reproduction, fertilisation of animals. Sex cells and gonads of animals. Types of animal development. Manifestations of animal life. Meaning of concepts and terms: animals, ectoderm, entoderm, mesoderm, two- and three-layer animals, body symmetry, body cavity, body integument, irritability, direct and indirect development, fertilisation, hermaphrodites, developmental cycle/life cycle. BE ABLE TO. Determine the correct application of these concepts and terms. Visually recognise and characterise animal organs and organ systems, type of circulatory system, type of nervous system, type of body symmetry. Compare: transport of substances in animals of different groups; digestive, circulatory, respiratory, nervous systems of animals of different groups; structure of the skeleton, brain of vertebrates. Distinguish between: types of skeleton; types of body cavity; types of animal development; ways of moving animals, types of intestines, forms of fertilisation.
3.13	**Animal behaviour**	Innate and acquired behaviour. Forms of animal behaviour: exploratory, foraging, defensive, hygienic, reproductive (search for mates, parental behaviour and care of offspring), territorial, social. Ways of orientation of animals. Homing. Animal migration. Animal communication. Elementary mental activity.	TO KNOW AND UNDERSTAND The adaptive value of animal behavioural responses. Biological significance of innate and acquired animal behaviour. Examples: animal migration; ways of orientation, animal communication; forms of behaviour; use of tools by animals. Meaning of concepts and terms: instinct, learning, animal behaviour, migration, homing, animal groups, elementary mental activity. BE ABLE TO. Determine the correct application of these concepts and terms. Distinguish between forms of animal behaviour. Explain: changes in animal behaviour with age;

			cyclical changes in animal behaviour.
3.14	**Diversity, distribution, importance of animals**	Diversity, distribution, importance of animals Stingrays, or Gastropods, their diversity: Aurelia jellyfish, rooter jellyfish, hydra, actinia, madrepore corals. Flatworms. A variety of parasitic flatworms: Flukes (liver fluke and cat fluke), Tapeworms (bovine and porcine tapeworms, echinococcus, broad tapeworm). Nematodes, or roundworms. A variety of parasitic nematodes (human roundworm, pinworm, trichinella). Ringworms /Tapeworms/, their diversity:: Large bristle worms (nereis), small bristle worms (earthworm, tube worm), leeches (medical leech). Arthropods. Crustaceans. The variety of crustaceans (river crayfish, crabs, shrimps, daphnia, cyclopes, woodlice), their role in nature and human life. Arachnids, their diversity (spiders: cross spider, caracurta, tarantula; ticks: scabies itch, dog tick). Insects, their variety: Cockroaches (red cockroach), Hymenoptera (green grasshopper, travelling locust), Diptera (May beetle, ladybug, deer beetle, Colorado potato beetle), Hymenoptera (honey bee, ants), Lepidoptera (cabbage whitefly, mulberry silkworm, mahogany), Diptera (housefly, malaria mosquito). Parasitic and bloodsucking insects (fleas, lice, bed bugs, mosquitoes, gadflies, gadflies) as carriers of human pathogens. Mollusks /Mollusks/. Variety of mollusks: Gastropods (grape slug, great pond slug, slugs), Bivalves (toothless, pearl mussels, mussels), Cephalopods (squid, cuttlefish, octopus). Chordates, general features of structure and life processes. Variety of chordates. Fishes. Variety of fish: Cartilaginous fishes (sharks and rays), Bony fishes - Sturgeon-like (sturgeon), Herring-like (herring), Salmon-like (pink salmon), Perchlike (pike perch), Carp-like (roach, bream, crucian carp, carp). Amphibians or Amphibians. A variety of amphibians: Tailless (pond frog, common toad), Legless (ringworm), Tailed (spotted	KNOW AND UNDERSTAND Common features of arthropods, mollusks, chordates. Features of structure, life processes, reproduction and development, lifestyle, behaviour: intestinal cavities on the example of a hydra; flatworms on the example of a milk-white planarian; roundworms on the example of a human roundworm; ringworms on the example of an earthworm; crustaceans on the example of a river crayfish; arachnids on the example of the cross spider; insects on the example of the May beetle; fish on the example of the river perch; amphibians on the example of pond frog; reptiles on the example of the fast lizard; birds on the example of the pigeon; mammals on the example of the rabbit or rat. Features of distribution, structure and life processes, developmental cycles of parasitic worms. Characteristic features, diversity, role in nature and human life of animals within the specified taxa and representatives. Structure of bird eggs. Signs of adaptation of animals to the conditions of existence in water, on land, in soil (insects to flight; fish to life in water; reptiles to life on land; amphibians to water-land life; birds to flight). Signs of adaptation of animals to parasitism on the example of parasitic worms and arthropods. Seasonal phenomena in the life of animals (fish, amphibians, reptiles, birds, mammals). Reasons for the distribution of animals of different taxa on the globe. Interrelationships between animals and other organisms. Ways of infecting humans with parasitic animals. BE ABLE TO. Visually recognise the specified representatives of animals, the characteristic features of animals of the given taxa, compare the elements of the body structure with the representatives of animals on the example of the specified species. Distinguish between: life forms of intestinal cavities (jellyfish, polyps); brood and breeding birds; sedentary, nomadic and migratory birds; insects with complete and incomplete transformation; marine, freshwater, and migratory fish. Classify animals: by habitat; ways of life, movement, nutrition; type of development. Compare: the structure of eggs of birds and reptiles; features of the external, internal structure and sensory organs of different groups of animals. Establish: the relationship between the structure and lifestyle of animals; complications in the structure of animals of different taxa. Justify measures to prevent diseases caused by parasitic worms.

		salamander, newt). Reptiles, or Reptiles. A variety of reptiles: Scaled lizards (nimble lizard, common viper, common boa constrictor), turtles (marsh turtle, sea turtle), crocodiles (Nile crocodile, alligator). Birds. A variety of birds: Beakless (ostriches, kiwi), Beaked - Penguinlike (emperor penguin), Woodpeckers (great crested woodpecker), Hen-like (quail, grouse, pheasant, bank chickens), Goose-like (mute swan, mallard duck, grey goose), Falconiformes (great hawk, golden eagle), Owliformes (eared owl), Storkiformes (white stork, grey heron), Craneiformes (grey crane), Sparrowiformes (rook, grey crow, magpie, city swallow, great tit). Mammals. The variety of mammals: Primates - oviparous mammals (platypus, echidna); Marsupials (kangaroo, koala); Placental mammals: Insectivores (common hedgehog, mole), Cheiropterans (red evening bat, nuthatch), Rodents (marmot, squirrel, beaver, house mouse, hamster, rat, nutria), Carnivores (wolf, dog, fox, tiger, lion, lynx, domestic cat, polar bear, brown bear, marten, sable), Cetaceans (blue whale, sperm whale, killer whale, white-beaked dolphin), Ungulates (non-ruminant: wild boar, hippopotamus; ruminants: bison, roe deer, elk, goats, sheep), Odd-legs (domestic horse, Przewalski's horse, zebra, kulan, rhinoceros), Primates (lemurs, monkeys, macaques, baboons, orangutan, chimpanzee, gorilla).	
4.1	**The human body as a biological system. Structure of the human body**	Tissues of the human body, their structure and functions. Organs, organ systems. Regulatory systems of the human body.	TO KNOW AND UNDERSTAND The place of a person in the organic world. Types of tissues of the human body (nervous; epithelial: integumentary epithelium, glandular epithelium; muscle: striated skeletal, striated cardiac, unstriated /smooth/; internal environment (blood, lymph, bone, cartilage, connective tissue), their functions. The essence of nervous, humoral, immune regulation. Meaning of concepts and terms: tissue, organ, physiological organ system, functional organ system, nervous regulation, humoral regulation, immune regulation, homeostasis. BE ABLE TO.

			Determine the correct application of the specified concepts and terms. Visually recognise types of tissues, organs, organ systems of the human body. Identify the main features of the structure of different types of tissues. Establish: the correspondence between cells and tissue types; the relationship between the structure and functions of human tissues. To prove the participation of regulatory systems in ensuring homeostasis. Justify judgements about the human body as an integral and open biological system.
4.2	**Nervous regulation. The human nervous system**	Neuron is a structural and functional unit of the nervous system. Reflex principle of the nervous system. Reflex arc, its components and functioning. Central and peripheral nervous systems. Structure and function of the spinal cord and brain. The autonomic nervous system (sympathetic and parasympathetic divisions). Influence of the autonomic nervous system on the body's activity.	TO KNOW AND UNDERSTAND Functions of the nervous system. The principle of the nervous system. Structural features of the nervous system. Functions of the spinal cord, brain and its parts, somatic nervous system, autonomic nervous system. Location and functional significance of cortical areas of the cerebral hemispheres. Negative effects of alcohol and smoking on the nervous system. Meaning of the following concepts and terms: neuron, neuroglia, nerve, nerve centre, nerve node, reflex, reflex arc, synapse, central nervous system, peripheral nervous system, autonomic nervous system, somatic nervous system, white matter, grey matter, myelin sheath, mediator, cranial nerves, spinal nerves, meninges, furrows, gyrus. BE ABLE TO. Determine the correct application of the specified concepts and terms. Visually recognise and describe: elements of the structure of a neuron; components of the reflex arc; elements of the structure of the spinal cord; brain regions; lobes of the cerebral hemispheres. Distinguish between: sensory, motor, mixed nerves; the influence of the sympathetic and parasympathetic nervous systems on the body's activity.
4.3	**Humoral regulation. Human endocrine system.**	Functions and structure of the endocrine system. Endocrine glands (glands of internal and mixed secretion). Hormones and neurohormones, their influence on vital processes. Functions of the endocrine and mixed secretion glands, consequences of their disruption. Differences between nervous and humoral regulation of physiological functions of the body.	KNOW AND UNDERSTAND Factors of humoral regulation. Organs of the endocrine system, their functions. Location of endocrine glands in the human body. Features of the structure and functioning of the endocrine glands. Consequences of hyper- and hypofunction of endocrine glands. The role of the nervous system in the regulation of endocrine glands. The importance of the endocrine system in maintaining homeostasis and adaptation of the body. Properties of hormones. The principle of regulation of hormone secretion. Meaning of concepts and terms: hormones, neurohormones, endocrine glands, hypothalamic-pituitary system. BE ABLE TO. Determine the correct application of these concepts and terms. Visually recognise and characterise endocrine glands. Distinguish between glands of external, internal and mixed secretion. Correlate hormones and endocrine glands. Describe the effect of hormones on metabolic processes in the human body. Compare nervous and humoral regulation. Justify measures to prevent diseases associated with endocrine gland

			dysfunction.
4.4	**Internal environment of the human body. Blood. Lymph**	Internal environment of the human body. Functions of blood. Composition of blood: plasma, formed elements (red blood cells, white blood cells, platelets). Blood groups of the ABO system. The concept of the Rh factor. Blood transfusion. Blood coagulation. Composition and functions of lymph.	TO KNOW AND UNDERSTAND Components of the internal environment of the human body (blood, lymph, tissue /intercellular / fluid). Functions of blood and lymph. Composition of blood, blood plasma, lymph, tissue/intercellular/ fluid. Microscopic structure of blood. Normal blood counts (glucose, haemoglobin, erythrocyte and leukocyte counts, erythrocyte sedimentation rate / ESR/). Causes of blood incompatibility during transfusion. Rules of blood transfusion. Physiological essence and importance of blood coagulation. Phases of blood coagulation. Factors of blood coagulation (thromboplastin, prothrombin, fibrinogen, vitamin K, calcium ions). Mechanisms for preventing intravascular coagulation. Haematopoietic organs (red bone marrow, spleen, lymph nodes, thymus / thymus gland/. Meaning of the concepts and terms: Rh factor, Rh conflict, donor, recipient, agglutination, anaemia, haemophilia, haemolysis. BE ABLE TO. Determine the correct application of these concepts and terms. Describe the components of blood. Visually recognise the shaped elements of blood and determine the main features of their structure. Establish the relationship between the structure and functions of blood cells. Compare: the composition of blood, lymph, tissue/intercellular/fluid; blood groups of the ABO system by the content of agglutinogens and agglutinins. Determine the compatibility of blood groups. Draw up a diagram of: the relationship between the components of the internal environment, the interaction of blood coagulation factors. Analyse blood parameters obtained in the study.
4.5	**Human circulatory and lymphatic systems**	Structure of the circulatory and lymphatic systems. Blood circulation, its regulation. Structure of the heart. Properties of the heart muscle. Cardiac cycle, its phases. Heart function, its regulation. Blood vessels, their structure and functions. Large and small circles of blood circulation. Blood pressure. Lymphatic system, its structure and functions. Lymphatic circulation.	TO KNOW AND UNDERSTAND Features of the structure of the heart muscle. The main properties of the heart muscle (excitability, conduction, contractility, automaticity). Functions of heart and venous valves. Heart rate of the human heart at rest. The duration of the cardiac cycle and its phases. The value of blood pressure in the normal state. The value of blood circulation. Features and importance of lymph circulation. Functions of the lymph nodes. The negative impact of alcohol and tobacco smoking on the cardiovascular system. Meaning of concepts and terms: blood circulation, blood pressure, blood pressure, arteries, veins, capillaries, coronary vessels, lymphatic capillaries, myocardium, epicardium, endocardium, pericardium, conduction system of the heart, cardiac cycle, systole, diastole, pulse. BE ABLE TO. Determine the correct application of these concepts and terms. Describe: large and small circles of blood circulation; blood flow through blood vessels (blood pressure, blood velocity); heart function; phases of the cardiac cycle; regulation of heart function (influence of

			the nervous and endocrine systems, calcium and potassium ions). Compare: the structure of arteries, veins, capillaries; blood and lymphatic capillaries. Establish the relationship between the structure and functions of: the heart; blood vessels. Visually recognise: circulatory organs (heart, aorta, pulmonary arteries, pulmonary veins, vena cavae); large and small circle circulation; elements of the heart structure (right and left ventricles, right and left atrium, heart valves - bicuspid / mitral /, tricuspid, pulmonary, aortic). Analyse quantitative indicators of the circulatory system. Predict changes in the circulatory system during physical activity. Explain the consequences of: impaired lymph flow, blood circulation; increased/decreased heart rate, blood pressure. Distinguish between types of bleeding and choose the method of first aid. Justify measures to prevent cardiovascular disease.
4.6	**Immunity. Human immune system**	Immunity, its types. Immune system, its composition and features of functioning. Mechanisms of interaction of the antigen-antibody system. Allergic reactions. The concept of immunocorrection and immunotherapy. Prevention of human infectious diseases.	TO KNOW AND UNDERSTAND Functions of the immune system. Organs of the immune system (central - bone marrow, thymus; peripheral - spleen, lymph nodes, tonsils, lymphoid tissue), their functions. Cells of the immune system (B- lymphocytes, T-lymphocytes, macrophages), their functions. Substances with protective properties (immunoglobulins / antibodies /, interferons, lysozyme). Negative effects of alcohol on the immune system. Meaning of concepts and terms: immunity, specific immunity, nonspecific immunity. Artificial immunity, natural immunity, innate immunity, cellular immunity, humoral immunity, therapeutic serum, vaccine, antigen, antibody, immunocorrection, immunodeficiency, immunomodulators, autoimmune processes, allergy. BE ABLE TO. Distinguish between types of immunity. Compare: innate and acquired immunity; therapeutic serum and vaccine. Explain the mechanisms of interaction of antigen-antibody systems. Justify measures for the prevention of infectious diseases humans.
4.7	**Respiration. Human respiratory system**	Structure and functions of the respiratory system. Processes of gas exchange in the lungs and tissues. Respiratory movements. Processes of inhalation and exhalation. Neurohumoral regulation of respiration. The concept of vital capacity of the lungs. Composition of inhaled, exhaled and alveolar air. The vocal apparatus and its functioning.	TO KNOW AND UNDERSTAND The importance of breathing. Stages of breathing. Structure and function of the respiratory organs (nasal cavity, nasopharynx, larynx, trachea, bronchi, lungs). Respiratory processes and their regulation. Basic respiratory parameters (frequency, depth of breathing), their value at rest. Components and functions of the vocal apparatus. The process of voice and speech sounds formation. Negative effects of alcohol and tobacco smoking on the vocal apparatus and respiratory function. Meaning of concepts and terms: respiration, gas exchange, external respiration, internal /tissue/ respiration, airways, vital capacity of the lungs, respiratory volume, reserve volume, residual air, pleural cavity, respiratory muscles, respiratory movements, epiglottis, respiratory centre.

			BE ABLE TO. Determine the correct application of these concepts and terms. Visually recognise and characterise the respiratory organs. Establish the relationship between the structure and functions of the respiratory system. Compare: the composition of inhaled, exhaled, alveolar air; gas exchange in the lungs and tissues. Make a diagram of gas exchange in the lungs and tissues. Predict changes in the respiratory system: during physical activity; under the influence of environmental stimuli. Explain the negative effects of smoking on the respiratory system and the voice apparatus. Justify measures to prevent diseases of the respiratory and vocal apparatus.
4.8	**Digestion. The human digestive system**	Structure and functions of the digestive system. Digestive glands (salivary, liver, pancreas). Digestive juices. Structure and functions of teeth. Digestion in the mouth, stomach, intestines. Parietal digestion. The process of absorption. Regulation of digestive processes.	TO KNOW AND UNDERSTAND The importance of digestion. Functions of the digestive system. Digestive processes and their regulation. Structure of the digestive organs, their functions. Structure and importance of teeth, human dental formula. Composition of saliva, gastric, pancreatic, intestinal juices, bile. Features of digestion in different parts of the digestive tract. The importance of intestinal microflora. The essence of the processes of swallowing, digestion, absorption. The role of digestive glands and enzymes in digestion. Negative impact on digestion of alcoholic beverages and tobacco smoking. Meaning of concepts and terms: digestion, digestive tract, digestive glands, digestive juices, digestive enzymes (pepsin, trypsin, chymotrypsin, lipase, amylase, maltase), secretion, parietal digestion, absorption, peritoneal peristalsis, duodenum, jejunum, ileum, cecum, appendix, colon, rectum, swallowing centre. BE ABLE TO. Determine the correct application of the specified concepts and terms. Visually recognise: digestive organs, elements of tooth structure, types of teeth. Correlate digestive enzymes and digestive juices. Establish the relationship between: the external structure and functions of teeth; the structure and functions of the digestive system. Recognise the signs of poisoning and choose the method of first aid. Justify prevention measures for: dental and digestive diseases; food poisoning.
4.9	**Metabolism and energy conversion in the human body**	Nutrition and metabolism. The concept of a balanced /rational/ diet. Protein, lipid, carbohydrate, water and mineral metabolism. The concept of drinking water quality. The role of enzymes, ATP in ensuring metabolic processes. Vitamins, their role in metabolism. Metabolic disorders associated with a lack or excess of certain vitamins. Negative impact on the metabolism of toxic substances. Elimination of toxic compounds in the human	TO KNOW AND UNDERSTAND Functional significance of proteins, fats, carbohydrates, vitamins, water and mineral salts for the human body. Nutritional and energy needs of a person. The importance of a balanced diet. Consequences of vitamin deficiency. Features of neutralisation of toxic compounds in the human body. Meaning of the concepts and terms: metabolism, vitamins, toxins, balanced /rational/ nutrition. BE ABLE TO. Determine the correct application of these concepts and terms. Draw up diagrams of the metabolism of

		body. Neurohumoral regulation of metabolic processes.	carbohydrates, lipids, proteins in the human body. Compare the energy and plastic value of different substances. Distinguish between fat-soluble and water-soluble vitamins. Correlate vitamins and food products. Analyse the diet. Correctly assess the importance of drinking water quality and a balanced diet for health.
4.10	**Excretion. The human urinary system**	Structure and functions of the urinary system. Structure and functions of the kidneys. Nephron as a structural and functional unit of the kidneys. Processes of urine formation and excretion, their regulation. The role of the kidneys in water and salt metabolism.	TO KNOW AND UNDERSTAND The importance of excretion. Organs of excretion of metabolic products. Organs and functions of the urinary system. Structure and function of the kidneys. The role of the kidneys in water and salt metabolism. Structure of the nephron. Processes of formation and excretion of urine, their regulation. The composition of urine. Negative effects of alcohol on kidney function. Meaning of concepts and terms: nephron, cortex, medulla, filtration, reabsorption, renal pelvis, renal gland, renal pyramid, antidiuretic hormone/vasopressin. BE ABLE TO. Determine the correct application of the specified concepts and terms. Visually recognise: organs of the urinary system; elements of the structure of the kidney, nephron. Compare the composition of primary urine, secondary urine, blood plasma. Justify measures to prevent diseases of the urinary system. To prove the importance of excretion of end products of metabolism from the human body.
4.11	**Skin. Thermoregulation**	Structure and functions of the skin. The role of the skin in the excretion of metabolic products. Thermoregulation and the role of the skin in this process.	TO KNOW AND UNDERSTAND Functions of the skin. Components of the skin, features of their structure. Skin derivatives, skin glands, their functions. The role of the skin in the excretion of metabolic products and regulation of body temperature. Causes of sunstroke and heatstroke. The importance of skin in the adaptation of the body to environmental conditions. Negative effects of alcohol and smoking on the skin. Meaning of concepts and terms: epidermis, dermis, subcutaneous tissue, melanin, thermoregulation. BE ABLE TO. Determine the correct application of these concepts and terms. Visually recognise the elements of the skin structure. Establish the relationship between the structure and functions of the skin. Recognise the signs of sunstroke and heatstroke and choose how to provide first aid. Justify: the rules for caring for one's own skin; measures to prevent skin diseases.
4.12	**Human musculoskeletal system**	Importance, functions, structure of the musculoskeletal system. Chemical composition, structure, growth of bones. Types of bone connections. Structure of the skeleton. Features of the human skeleton due to erectile dysfunction. Muscle tissues. Structure and function of skeletal muscles. The main groups of skeletal muscles.	TO KNOW AND UNDERSTAND Components and functions of the musculoskeletal system. Conditions of motor function. Features of growth and age-related changes in bone chemical composition. Functions of the main skeletal muscle groups. The importance of exercise for the proper formation of the skeleton and muscles. Mechanism of contraction and relaxation of skeletal muscles. Causes of muscle fatigue. Nervous regulation of motor activity. The role of the cerebral cortex in the

		Mechanism of muscle contraction. Work, tone, strength and fatigue of muscles. Regulation of motor activity.	regulation of voluntary human movements. Meaning of concepts and terms: periosteum, compact bone substance, spongy bone substance, bone plate, osteocytes, osteon, red bone marrow, yellow bone marrow, joint, ligaments, tendons, fascia, myofibrils, actin, myosin, muscle strength, muscle tone, fatigue, posture, physical inactivity. BE ABLE TO. Determine the correct application of these concepts and terms. Visually recognise and characterise: skeletal compartments and the bones that form them; types of bone connection (fixed, semi-mobile, mobile); elements of the structure of tubular bone; bone, cartilage, muscle tissue; elements of the structure of skeletal muscle. Distinguish between: active and passive parts of the musculoskeletal system; types of bones (long, short, flat, mixed, air-bearing); contractile and non-contractile parts of skeletal muscle; static and dynamic work. Compare: the structure of flat and tubular bones; physiological features of striated and non-striated muscles. Classify muscles by function. Recognise injuries to the musculoskeletal system and choose how to provide first aid; justify the role of physical activity in maintaining health.
4.13	**Human sensory systems**	General characteristics of sensory systems. The role of sensory systems in ensuring communication between the body and the environment. Sensory systems of sight, hearing, balance, smell, taste, touch, temperature, pain. Receptors, their types. Sensory organs as peripheral parts of sensory systems. Structure and functions of the organs of sight, hearing and balance.	TO KNOW AND UNDERSTAND The structure and general principle of the sensory system. Features of the structure and function of the main sensory systems. Processes of perception: images of objects; light; colours; sounds; body balance; taste; smells; touch; pain. Meaning of concepts and terms: sensory systems, sensory adaptation, sensory organs, receptors, accommodation, myopia, hyperopia, astigmatism, colour blindness, optical system of the eye. BE ABLE TO. Determine the correct application of these concepts and terms. Visually recognise and describe the elements of the structure of the organs of sight, hearing, balance. Establish the relationship between the structure and functions of the organs of vision, hearing, balance. Justify: rules of hygiene of the organs of vision and hearing; measures to prevent visual and hearing disorders.
4.14	**Higher human nervous activity**	Nervous processes, their indicators. Unconditional and conditional reflexes, instincts. Formation of conditioned reflexes. Formation of temporary nerve connections, their importance for the formation of conditioned reflexes. Inhibition of conditioned reflexes. Physiological basis of speech. The first and second signalling systems. Learning. Memory. Higher human nervous activity and its main types. Types of temperament. Sleep as a	TO KNOW AND UNDERSTAND Nervous processes: excitation, inhibition. Indicators of nervous processes: strength, mobility, balance. Mechanisms of reflex formation. The importance of the second signalling system. Features of higher human nervous activity. The importance of sleep. Types of sleep. The role of the cerebral cortex in thinking. Causes of individual characteristics of a person. Negative effects of alcohol and smoking on higher nervous activity. Meaning of concepts and terms: excitation, inhibition, instinct, unconditioned reflexes, conditioned reflexes, temporary nervous connection, memory.

		functional state of the body, its importance.	BE ABLE TO. Determine the correct application of the above concepts and terms. Compare: conditional and unconditional reflexes; first and second signalling systems; types of higher nervous activity of a person. Classify unconditioned reflexes. Recognise: instinctive and acquired human behaviour; type of temperament; conditioned and unconditioned reflexes. Distinguish between: types of learning; types of memory; types of higher nervous activity and temperament. Justify the rules of mental activity.
4.15	**Human reproduction and development.**	Structure of the human reproductive system. Functions of the human gonads. Structure of human germ cells. Gametogenesis. Primary and secondary sexual characteristics. Periods of human ontogeny. Development of the embryo and fetus, functions of the placenta. Development of the child after birth.	KNOW AND UNDERSTAND The structure of the human reproductive system. Functions of the gonads and placenta. Stages of gametogenesis. Differences in the structure and processes of formation of male and female gametes. Periods of human ontogeny. Stages of embryonic and postembryonic human development. Primary and secondary sexual characteristics. The role of the endocrine system in the regulation of haematogenesis, ovulation, pregnancy, puberty. The negative impact of alcohol and tobacco smoking on the reproductive system. Meaning of concepts and terms: pregnancy, placenta, puberty. BE ABLE TO. Determine the correct application of these concepts and terms. Visually recognise and characterise: human germ cells; stages of human gametogenesis. Compare the structure and development of male and female germ cells. Establish the relationship between the structure and functions of male and female gametes.
5.1	**Fundamentals of ecology and evolutionary doctrine. Ecological factors. Population**	Ecological factors and their classification. The concept of the optimal range of action of an environmental factor. Patterns of influence of environmental factors on living organisms. Adaptation of living organisms to the effects of environmental factors. Ecological valence. Ecological niche as a result of adaptation of organisms to exist in the ecosystem. The concept of population. Structure and characteristics of populations. Population parameters. Population waves. The concept of a minimum viable population. Ecological strategies of populations.	KNOW AND UNDERSTAND Ecological factors: abiotic, biotic, anthropogenic/anthropic/. Patterns of influence of environmental factors on living organisms (laws of limiting factor, tolerance, cumulative effect of factors). Parameters of an ecological niche. The rule of mandatory filling of an ecological niche. Population parameters: number, density, age, sex and genetic structure, growth, fertility, mortality. Meaning of concepts and terms: ecology, ecological valence, ecological niche, ecological factors, limiting factors, optimal and pessimistic conditions, habitat, tolerance, population, population structure, population waves, minimum viable population, population homeostasis. BE ABLE TO. Determine the correct application of these concepts and terms. Classify environmental factors. Distinguish between: steno- and eurybiont species, static and dynamic population parameters, ecological strategies of populations. Describe population parameters. Analyse tabular data and graphical representations that show the value or change in population parameters. Model the consequences of significant overlap in the ecological niches of competing species.
5.2	**Ecosystems**	Components, properties and characteristics of an ecosystem.	KNOW AND UNDERSTAND Components, properties and characteristics of

		Biocenosis and biotope. Types of relationships between populations of different species in ecosystems. Energy transformation in ecosystems. The concept of producers, consumers and reducers. Trophic structure of biocenosis. Ecological pyramids. Spatial heterogeneity of biocenosis. Structural diversity of biocenosis. Temporal heterogeneity of ecosystems (phenological changes, succession).	ecosystems. Ways of assimilation, transfer and dissipation of energy in ecosystems. The main biomes of the Earth. Examples: primary and secondary succession; trophic chains and trophic networks; phenological changes. Meaning of concepts and terms: biotope, biotic relationships, biocenosis, agrocenosis, ecological pyramid, mosaic biocenosis, ecosystem productivity, producers, consumers, reducers, succession, trophic chain, trophic level, trophic net, tiered biocenosis, species richness of biocenosis, species diversity of biocenosis. BE ABLE TO. Determine the correct application of these concepts and terms. Distinguish between: types of biotic relationships in a biocenosis; primary and secondary succession; grazing / eating / and detrital / decomposition / trophic chains. Identify types of interactions between populations in ecosystems. Draw up diagrams of the transfer of substances and energy in ecosystems. Analyse the structural diversity of biocenosis and predict its sustainability. Compare the features of the organisation and functioning of agrocenoses and natural ecosystems.
5.3	**The biosphere as a global ecosystem**	Structure and boundaries of the biosphere. Biogeochemical cycles /circulation of substances/ as a necessary condition for the existence of the biosphere. Vernadsky's doctrine of the biosphere and noosphere and its importance for avoiding the global environmental crisis. Basic ideas about anthropogenic / anthropic / impact on the biosphere. Types of pollution, their consequences for ecosystems and humans. The concept of environmental quality. Modern global environmental problems of the world, environmental problems in Ukraine. Anthropogenic / anthropic / impact on biodiversity (species extinction, species-universe). Conservation of biodiversity as a prerequisite for the stability of the biosphere. Current trends in nature conservation and environmental protection in Ukraine and the world. Basic provisions of nature management. The concept of sustainable development.	KNOW AND UNDERSTAND Structure and boundaries of the biosphere. Key biogeochemical cycles. The essence and significance of the concept of sustainable development. The role of the basic laws of nature management in the formation of the principles of balanced nature management in the context of sustainable development. Current trends in nature protection in Ukraine and the world. The impact of environmental factors and indicators of its quality on human health and safety. Meaning of concepts and terms: anthropogenic / anthropic / impact, biosphere, biogeochemical cycle, invasive species, ecological network, environmental policy, living matter of the biosphere, biogenic matter, inanimate / non-living / matter, biocosmic matter, pollution, noosphere, nature protection, rational environmental management, ecological thinking, sustainable development. BE ABLE TO. Determine the correct application of these concepts and terms. Distinguish: types of substances in the biosphere; types of environmental pollution; sources of environmental pollution. Analyse: schemes of biogeochemical cycles, anthropogenic changes in the biosphere, the state of the environment. Predict the consequences of environmental pollution for living organisms and humans in particular.
5.4	**Adaptation as a general property of biological systems**	General patterns of adaptation formation. The concept of pre-adaptation and post-adaptation. Properties of adaptations. Formation of adaptations at the molecular and cellular levels of	TO KNOW AND UNDERSTAND General patterns of adaptation formation. The importance of pre-adaptations and post-adaptations in the evolution of the organic world. Basic properties of adaptations. Formation of adaptations at the molecular and cellular levels of organisation. The principle of

		organisation. The principle of unity of organisms and their habitat. Strategies of adaptation of organisms. The concept of ecologically plastic and ecologically non-plastic species. The concept of adaptive radiation. Life forms of animals and plants as adaptations to the environment. The concept of conjugate evolution and co-adaptation. The main habitats and adaptations of organisms to them. Methods of thermoregulation of organisms. Symbiosis and its forms. The organism as a habitat. Spread of parasitism among different groups of organisms. Adaptations of parasites to living in the host. The response of the host organism to the settlement of parasites. Adaptive biological rhythms of biological systems of different levels of organisation. Types of adaptive biological rhythms of organisms. Photoperiodism and its adaptive significance.	unity of organisms and their environment. Methods of thermoregulation of organisms. The main forms of symbiosis of organisms: mutualism, commensalism, parasitism. Examples: adaptations of organisms to environmental factors, to different habitats; adaptive biological rhythms. The essence and importance of photoperiodism. Adaptive significance of photoperiodism. Features of the main habitats of organisms. Meaning of concepts and terms: adaptation, pre-adaptation, post-adaptation, adaptive potential, ecological niche, adaptive radiation, co-evolution, co-adaptation, life form, adaptive biological rhythms, photoperiodism. BE ABLE TO. Determine the correct application of the specified concepts and terms. Distinguish between: types of adaptive biological rhythms of organisms (external, internal, daily, monthly, tidal, seasonal, annual, perennial); forms of symbiosis; representatives of different ecological groups of plants. Correlate: adaptations of organisms to the environment; human adaptations to living conditions. Identify: signs of adaptation of organisms to the environment; adaptive nature of behavioural reactions of animals. Compare: peculiarities of thermoregulation of poikilothermic and homoithermic animals; adaptation of different groups of organisms to a particular habitat. Draw diagrams of complexes of adaptations that characterise a particular life form of organisms.
5.5	**Fundamentals of the evolutionary doctrine**	The concept of evolution. The evolutionary hypothesis of J.-B. Lamarck. The main provisions of the evolutionary theory of Darwin. Combination of Darwin's theory and genetics: synthetic theory of evolution. Population of organisms as a unit of evolution. The concept of microevolution. Factors of change in the genetic structure of a population: mutations, isolation, migration, gene drift, natural selection. Patterns of allele distribution in populations. Methods of speciation. The concepts of divergence, convergence and parallelism, analogous and homologous organs, rudiments and atavisms, biological progress and regression. Views on the origin of life on Earth (creationism, panspermia, abiogenesis).	KNOW AND UNDERSTAND The importance of evolution. The essence of: J.-B. Lamarck's evolutionary hypothesis; the main provisions of Darwin's evolutionary theory; the main provisions of the modern synthetic theory of evolution; different views on the origin of life. Causes and consequences of gene drift. Patterns of allele distribution in populations. The role of natural selection in adaptations to environmental changes. Key stages in the evolution of life on Earth (emergence of photosynthesis, emergence of eukaryotic cells through prokaryotic symbiosis, emergence of multicellular organisms). Meaning of concepts and terms: evolution, microevolution, isolation, gene drift, migration, divergence, convergence, parallelism, natural selection, parallelism, biological progress, biological regression, genetic structure of a population, gene pool of a population. BE ABLE TO. Determine the correct application of the specified concepts and terms. Describe the population as a unit of evolution. Distinguish between: similar and homologous organs, rudiments and atavisms, methods of speciation (geographical and ecological isolation of populations, reproductive isolation, random genetic changes).

ASSESSMENT CRITERIA, ASSESSMENT STRUCTURE AND PROCEDURE FOR ASSESSING KNOWLEDGE, SKILLS AND ABILITIES OF ENTRANTS

The entrance examination in Biology is conducted in the form of an exam (written test).

Each version of the test has 30 test tasks that have five answer options or four answer options, of which only **ONE is correct.** The task is considered completed if the applicant selects and marks the correct answer in the answer sheet.

The score for answering a test question can have two values: for each correct answer - 5 points; if an incorrect answer is given, no option is marked, or an answer is given with two or more selected options, even if there is a correct one among them - 0 points.

13 legal answers - failed. 14 legal answers - compiled.

The knowledge, skills and abilities necessary for further mastering the disciplines of the master's degree in the field of study I "Healthcare and Social Security", specialties I1 "Dentistry", I2 "Medicine", I8 "Pharmacy" are subject to verification.

The entrance exam lasts 100 minutes. The applicant has 1 minute to answer each test question.

Table of conversion of the number of correctly given answers by the applicant for completing tasks into points (on a scale from 100 to 200 points)

Number of correct answers	Number points	Number of correct answers	Кількість балів
1-13	0 (failed)	22	160
14	120	23	165
15	125	24	170
16	130	25	175
17	135	26	180
18	140	27	185
19	145	28	190
20	150	29	195
21	155	30	200

LIST OF REFERENCES
TO PREPARE FOR THE ENTRANCE EXAM IN BIOLOGY
FOR THE MASTER'S DEGREE PROGRAMME

1. Biology textbook for the 6th grade. Ostapchenko L.I., Balan P.G., Matyash N.Y. (2014);
2. Biology textbook for 7th grade. Sobol V.I. (2015);
3. Biology textbook for grade 8. Sobol V.I. (2016);
4. Biology textbook for grade 9. Shalamov R.V. et al. (2017);
5. Biology and Ecology Textbook for Grade 10 (specialised level). Zadorozhnyi K.M. and Utevska O.M. (2018);
6. Biology textbook for grade 11 (academic level). Balan P.G., Verves Y.G.;
7. Visual reference book on biology for 10-11 grades;
8. Visual reference book on biology for 8-9 grades;
9. Biology. Reference book + Test tasks. (Full repeated course, preparation for external independent testing). Sobol V.I.;
10. Collection of tasks in genetics. Evseev RS;
11. Training tests in botany, zoology, human biology. Zadorozhnyi K.M.;
12. Tasks and exercises in biology for the high school course. Matyash N.Y., Korshevnyuk TV., Kozlenko O.G..
13. Biology: Textbook for 8th grade. general education. institutions / S.V. Mezhherin, Y.O. Mezhherina. - K.: Osvita, 2011.
14. Balan P.G. Biology: 11: Textbook for general education institutions / P.G. Balan, Y.G. Verves - K.: Genesis, 2011. 304 p.
15. Bazanova T.I. Biology: 8: Textbook for general education institutions / T.I. Bazanova, Y.V. Pavichenko, O.G. Shatrovsky - Kh.
16. Mezhherin S.V. Biology: 8: Textbook for general education institutions / S.V. Mezhherin, Y.O. Mezhherina - K.: Osvita, 2011. 256 p.
17. Musienko M.M. Biology: Textbook for 7th grade of general education institutions / M.M. Musienko, P.S. Slavnyi, P.G. Balan - K.: Genesis, 2007. - 288 p.
18. Serebriakov V.V. Biology: 8: Textbook for general education institutions / V.V. Serebriakov, P.G. Balan - K.: Genesis, 2008. - 288 p.
19. Stepaniuk A. et al. Biology: Textbook for 9th grade of general education institutions - Ternopil: Vidpovidnyky i prykhidnyky, 2009. - 288 p.

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