

Calendar thematical plan of lesson
12 grade
Subject - biology
(overall – 186 hours, 6 hours in a week)

№	Unit of the long term plan in course plan	Topic/Content of the Unit in the Long Term Plan	Learning objectives
I term			
1	12.1A Ecology	Species and genetic diversity of ecosystems. Sustainability of the ecosystem. Calculation of the biodiversity index by the Simpson index. Causes of reduction of species diversity and conservation of ecosystem structure.	12.3.1.1 establish the relationship between species diversity and ecosystem stability
		(FW) DCP, DEC ‘Use of statistical methods for the analysis of ecosystem’	12.3.1.1 establish the relationship between species diversity and ecosystem stability
		Use of statistical methods (χ^2 criterion, t-test) to determine the species diversity of ecosystem.	12.3.1.2 use statistical methods for ecosystem analysis (t-test, χ^2 -criterion)
		(M) ‘Use of statistical methods to analyse ecosystem (t-test, χ^2 criterion)’	12.3.1.2 use statistical methods for ecosystem analysis (t-test, χ^2 -criterion)
2	12.1B Cell biology	Structure of the main components of cells (nucleus, nucleoli, mitochondrion, plastids, vacuoles, membranea, Golgi apparatus, ER, ribosomes, lysosomes, cell center).	12.4.2.1 identify and describe the main components of cells using electronic micrographs
		Linear increase of organelles.	12.4.2.2 calculate the linear magnification of the organelles from micrographs
		(M) ‘Calculation of the linear increase in cell organelles by micrographs’	12.4.2.2 calculate the linear magnification of the organelles from micrographs

		Osmotic pressure. Osmosis in plant cells. Cell turgor. Plasmolysis. Deplasmolysis.	12.4.2.3 study the behavior of cells in solutions with different concentrations of salts
		(LW) P, DCP, DEC 'Influence of solutions of different concentrations on cells (osmosis)'	12.4.2.3 study the behavior of cells in solutions with different concentrations of salts
3	12.1CMollecular biology	Structure and composition of antibodies. Antibody specificity (paratope, idiotope).	12.4.1.1 explain the main mechanism of antigen-antibody reactions
		The mechanism of interaction between antigen and antibody	12.4.1.1 explain the main mechanism of antigen-antibody reactions
		Competitive and non-competitive inhibition of enzymes.	12.4.1.2 compare competitive and non-competitive inhibition of enzymes
		Regulation of enzyme activity	12.4.1.3 create a model of competitive inhibition
		Effects of medical drugs and heavy metal ions on enzyme activity	12.4.1.3 create a model of competitive inhibition
		(LW) DCP, DEC 'Study of the effect of activators and inhibition on amylases activity' (M) Competitive inhibition	12.4.1.3 create a model of competitive inhibition
		The use of enzymes in medicine, chemistry, in the food industry. Immobilization of enzymes.	12.4.1.4 discuss the possibility of using enzymes in medicine, chemistry, industry
		Enzymes of microorganisms.	12.4.1.4 discuss the possibility of using enzymes in medicine, chemistry, industry
		Coding of a polypeptide in a gene by a sequence of nucleotides.	12.4.1.5 explain how information about the structure of a protein in a DNA molecule is encoded
		Transcription. Promoter, transcripton, termination site. Transcription factors. RNA-polymerase I, RNA-polymerase II, RNA-polymerase III. Stages of transcription (initiation, elongation, termination).	12.4.1.6 explain the processes of transcription and modification mRNA
Processing modification of 5'-end and 3'-end. Posttranscriptional modification of pre-mribonucleic acid (splicing).	12.4.1.6 explain the processes of transcription and modification mRNA		

		Ribosome centers (mRNA binding site, peptidyl, aminoacyl and peptidyl transferase sites).	12.4.1.7 explain the process of protein synthesis
		Translocation is a cycle of the ribosome.	12.4.1.7 explain the process of protein synthesis
		Effect of exopeptidases and endopeptidases on polypeptides..	12.4.1.8 explain the effect of digestive enzymes on the substrate under optimal conditions
		Effect of lipase on lipids. The conditions necessary for the activation of enzymes (pepsinogen, trypsinogen, enterokinase).	12.4.1.8 explain the effect of digestive enzymes on the substrate under optimal conditions
4	12.1DTransport of substances	Types and direction of transport through the membrane (uniport, simport, antiport).	12.1.3.1 explain the mechanism of various types of transport of substances through the cell membrane
		(LW) DCP, DEC Study of membrane permeability	12.1.3.1 explain the mechanism of various types of transport of substances through the cell membrane
		The mechanism of active transport is based of the example of the sodium potassium pump. Protein pumps: proton, sodium-potassium and calcium. Co-transport.	12.1.3.2 explain the mechanism of active transport using the example of a sodium potassium pump
		Transfer of macromolecules and particles through the membrane: endocytosis and exocytosis	12.1.3.2 explain the mechanism of active transport using the example of a sodium potassium pump
		Membrane potential: resting and action potential (depolarization, repolarization and hyperpolarization). The role of the sodium- potassium pump in maintaining the membrane potential.	12.1.3.3 determine the role of active transport in maintaining the membrane potential
		Water potential. Osmotic and hydrostatic potentials. Water flow into the plant cell.	12.1.3.4 explain the essence of the water potential
		Symplastic, apoplastic, vacuolar transport routes and their significance. The role of Casparian strips when water moves in root. Transport of water and ions in xylem. Guttation.	12.1.3.5 explain the essence of the symplastic, apoplastic, vacuolar pathways of transport of substances

		Translocation of organic substances in phloem. Mass flow hypothesis by Munch and current under pressure. Sieve tubes.	12.1.3.6 explain the mechanism of translocation of substances applying the mass flow hypothesis
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Internal summative assessment – 80 min

II term

1	12.2A Nutrition	Structural components of chloroplast and their functions. The role of chloroplast pigments (chlorophyll a, chlorophyll b, carotene and xanthophyll) in the absorption of light.	12.1.2.1 establish the relationship between the structure and function of chloroplast
		(LW) DCP, DEC ‘Study of pigment content in leaves’ (chromatographic method)»	12.1.2.1 establish the relationship between the structure and function of chloroplast
		Separation and identification of chloroplast pigments. Location of pigment zones on chromatograph (Rf).	12.1.2.1 establish the relationship between the structure and function of chloroplast
		Photosystem I. Photosystem II. Reaction centres. Absorption spectrum and action spectrum. Fluorescence. (LW) DCP, DEC ‘Study of light absorption by chlorophyll’.	12.1.2.2 explain the process of light absorption by chlorophyll
		Light-dependent reaction. Photo activation of chlorophyll. Water photolysis. General scheme of cyclic and non-cyclic photophosphorylation (Z-scheme).	12.1.2.3 explain the processes taking place in the light phase of photosynthesis
		Light- independent reaction. Calvin cycle (Ribulose biphosphate carboxylation, renewal, regeneration). Role of RuBisCO (ribulose-1,5 biphosphate	12.1.2.4 explain the processes occurring during the dark phase of photosynthesis

		carboxylase/oxygenase).	
		Factors affecting the speed of photosynthesis. Limiting factors of photosynthesis: light intensity, concentration of carbon dioxide, temperature. (LW) P, DCP, DEC 'Study on limiting factors of photosynthesis'	12.1.2.5 investigate and explain the limiting factors of photosynthesis 12.1.2.6 generalize the information obtained in the modeling of the process of photosynthesis
		Leaf anatomy of C ₃ and C ₄ plants. Dimorphism of chloroplasts in C ₄ plants. The features of carbon dioxide fixation in mesophyll cells of C ₄ plants.	12.1.2.7 compare carbon fixation pathways in C ₃ and C ₄ plants
		The Hatch- Slack pathway. Carbon dioxide acceptors. The significance of C ₃ and C ₄ plants.	12.1.2.7 compare carbon fixation pathways in C ₃ and C ₄ plants
		Chemosynthesis. The formation of organic substances from CO ₂ by energy generated during the oxidation of inorganic compounds (ammonia, hydrogen, sulphur compounds, iron ions). Comparison of photosynthesis and chemosynthesis.	12.1.2.8 compare the features of the processes of photosynthesis and chemosynthesis
2	12.2B Respiration	Metabolism types.	12.1.4.1 explain the stages of energy exchange
		Nicolson scheme. Stages of energy exchange.	12.1.4.1 explain the stages of energy exchange
3	12.2C Coordination and regulation	Parts and areas of the cerebral cortex of the brain. The features of higher human nervous activity (thinking, memory, speech, attention). (D) 'Identifying higher nervous activity types'.	12.1.7.1 explain the characteristic features of higher human nervous activity

		Short-term and long-term memory. (D) 'Identifying the types of memory. Influence of attention span on short-term memory'. (D) 'Identifying the attention span'.	12.1.7.2 to investigate features of the higher nervous activity of human
		Transmission of hormonal signals into the cell. The mechanism of action of steroid and peptide hormones on target cells on the example of insulin and estrogen. Secondary messenger.	12.1.7.3 to explain the mechanism of hormone activity
		Growth substances. The mechanism of action of growth substances on plants (auxins, gibberellins, ethylene, abscisic acid).	12.1.7.4 to investigate the mechanism of action of plant growth stimulants
		(LW) DCP, DEC 'Impact of IAA on the growth of the root system'.	12.1.7.4 to investigate the mechanism of action of plant growth stimulants
Internal summative assessment – 80 min			
III term			
1	12.3A Reproductin	Gametogenesis. Stages of human gametogenesis.	12.2.1.1 make a diagram of human gametogenesis
		Comparison of spermatogenesis and oogenesis.	12.2.1.2 explain the difference between spermatogenesis and oogenesis
		Mechanism and stages of IVF. Ethical aspects of IVF.	12.2.1.3 describe the extracorporeal method of fertilization

2	12.3B Growth	Stem cells: meaning and features (regeneration, differentiation). Types of stem cells: embryonic and somatic. The practical importance of the use of stem cells. Ethical aspects of the use of stem cells.	12.2.3.1 explain the process of stem cell specialization
3	12.3C Laws of inheritance and variations	Statistical methods for analyzing the reliability of inheritance characteristics (t-test, χ^2 criteria). (M) 'The use of statistical methods in the analysis of inheritance characteristics (t-test, χ^2 criteria)'	12.2.4.1 use statistical methods for analyzing the reliability of inheritance characteristics (t- test, χ^2 criteria)
		The chemical basis of the gene. Organization of genes in prokaryotes and eukaryotes. Classification of genes: structural, regulatory. Structure and function of operons in prokaryotes. Regulation of gene expression in prokaryote and eukaryotes.	12.2.4.2 explain the organization of genes in prokaryotes and eukaryotes
		Promoters and regulators. The method of reporter genes for the study of promoter sites of genes. Enhancer section of the gene.	12.2.4.3 describe the working mechanism of regulatory zone of gene, enhancer section of gene and coding parts of gene
		General ideas about epigenetics. Molecular basis of epigenetics. Epigenetic effects in humans. Methylation of DNA.	12.2.4.4 explain the importance of epigenetics when studying the mechanism of gene regulation that do not affect gene sequence
		Spontaneous mutation of deoxyribonucleic acids. Errors of genetic processes: replication, repair, recombination.	12.2.4.5 find the relationship of mutation with repair, recombination and DNA replication

		'Human Genome' project. Biological significance of the research conducted within the framework of project. The role of bioinformatics in sequencing human genome deoxyribonucleic acid.	12.2.4.6 discuss the significance of 'Human Genome' project.
4	12.3D Microbiology	Stages of microbiological research. Methods of disinfection and sterilization when working with microorganisms. Resistance of microorganisms.	12.4.3.1 describe the methods of sterilization and asepsis
		Growth medium types and its preparation. (D) 'Preparation of liquid and solid mediums'	12.4.3.2 distinguish between liquid and solid mediums
		Methods and seeding technology on growth medium. Incubation.	12.4.3.3 describe inoculation and incubation processes
		Gram staining. Cell wall structure of gram-positive and gram-negative bacteria. (D) 'Study of gram- positive and gram-negative bacteria'.	12.4.3.4 study gram-positive and gram-negative bacteria
		Strain as a pure culture of viruses, bacteria and other microorganisms. Distinctive features of strains. Clonal lines of original cell.	12.4.3.5 the meaning of the term 'strain'
5	212.3E Biotechnology	Advantages of microclonal reproduction before traditional methods of plant propagation. Activation of the development of existing in the plant meristems. Induction of the emergence of adventitious kidneys by explant tissues.	12.4.3.6 describe the methods of micro-clonal propagation of plants
		Monoclonal antibodies. Methods of obtaining cellular hybridomas.	12.4.3.7 to explain how monoclonal antibodies are produced

		Social and ethical aspects of the use of genetic testing and gene therapy in medicine (genetic diseases for which there is and for which no treatment exists, as well as in vitro fertilization, embryo biopsy and selection, therapeutic abortions).	12.4.3.8 to discuss ethical issues and legal regulation of research in biotechnology
		Areas of application of monoclonal antibodies. Diagnostics of oncological diseases. Agglutination and immunofluorescence reactions. Radioimmunoassay.	12.4.3.9 explain the importance of monoclonal antibodies in the diagnosis and treatment of diseases
		The use of prokaryotes for the production of recombinant DNA. Structure of plasmids.	12.4.3.10 to explain ways of obtaining recombinant DNA
		Artificial and natural cloning. The role of mitosis in cloning. (D) 'Separation of DNA molecule in agarose gel'	12.4.3.11 to explain the mechanism of cloning the body
		Features of cloning plants and animals. Cloning results in animal husbandry and horticulture.	12.4.3.12 to compare the features of cloning plants and animals
		Ethical moral and legal issues of human cloning. Technological difficulties of human cloning. Social ethical and religious aspects. Biological safety of species.	12.4.3.13 to discuss human cloning from the ethical point of view

Internal summative assessment – 80 min

IV term

1		11.1A Ecology and the impact of human activities on the environment	
		11.1B Cell biology	

		11.1C Molecular Biology	
		11.2A Molecular biology (nucleic acids and protein biosynthesis)	
		11.1A Ecology and the impact of human activities on the environment	
		11.2B Transport of substances	
2		11.2C Breathing, excretion	
		11.3A Coordination and regulation	
		11.3B Cellcycle	
3		11.3C Growth, development and motion	
		11.3D Regularitiesofheredity	
		11.4A Regularities and variabilities	
		11.4B Evolutionary development and the basis of breeding.	