CATALOGUE OF ELECTIVE DISCIPLINES UNDERGRADUATE LEVEL

«6B015 - Training of teachers in natural science subjects»

Cycle of disciplines	Name of disciplines and their main sections	Work-tank (ECTS)
GED*1*	**CYCLE OF GENERAL EDUCATION DISCIPLINES (GED)**	
	Fundamentals of Economics and Entrepreneurship	**5**
1	Social production. Essence, forms, capital structure. Production costs. Production income in a market economy. Business concept. Types of entrepreneurial activity. Property theory, social forms of management. Goods, money. Social and economic system. Market emergence. Financial system. The role of the state in business development. Macroeconomics. Resource saving. The cyclical nature of economic development. Inflation and unemployment. Kazakhstan in the system of world economic relations.	
2	**Fundamentals of Law and Anti-Corruption Culture**	5
	The main provisions of the Constitution, the current legislation of the Republic of Kazakhstan; system of government bodies, terms of reference, goals, methods of state regulation of the economy, the role of the public sector in the economy; financial law and finance; mechanism of interaction between substantive and procedural law; the essence of corruption, the reasons for its origin; a measure of moral and ethical, legal responsibility for corruption offenses; current legislation in the field of anti-corruption	
3	**Human life safety**	5
	Life safety, its main provisions. Dangers, emergencies. Risk analysis, risk management. Human security systems. Destabilizing factors of our time. Social dangers, protection from them: dangers in the spiritual sphere, politics, protection from them: dangers in the economic sphere, dangers in everyday life, everyday life. The system of bodies for ensuring the safety of life, and the legal regulation of their activities	
4	**Ecology and sustainable development**	5
	Basic laws of functioning of living organisms, ecosystems of various levels of organization, the biosphere as a whole, their stability; the interaction of the components of the biosphere and the environmental consequences of human economic activity, especially in the context of the intensification of nature management; modern ideas about concepts, strategies and practical tasks of sustainable development in various countries and the Republic of Kazakhstan; problems of ecology, environmental protection, sustainable development	
5	**Leadership and youth policy**	5
	Leadership as a socio-psychological phenomenon, the main sociological theories of leadership, Qualitative characteristics of a leader, Leadership and responsibility, youth entrepreneurship, methods of assessing the leadership qualities of youth, Political leadership and youth, the development of the necessary practical skills for the effective organization of the work of leaders in the youth environment	
BD 2	**CYCLE OF BASIC DISCIPLINES (BD)**	
M-10.1	**Introduction to biology**	5
1	Modern development of biology. Modern theory of the origin of life. The	

	main stages of the formation of life on the planet. Forms of manifestation of life. The main patterns that characterize life. Organisms of a cellular structure. The hierarchy of the living in the biosphere. Structural elements of each level of the organization. Reproduction forms. Experimental study of ontogenesis. The main directions of the evolutionary process	
2	**Biology of cells and tissues**	4
	Cell theory. Prokaryotes and eukaryotes. The main components of the cell: cell wall, plasma membrane, cytoplasm and its organelles Features of the structure and functions of animal tissues: epithelial, connective, muscular, nervous tissues	
3	**General chemistry**	3
	Theoretical foundations of inorganic chemistry. Atomic-molecular doctrine, basic stoichiometric laws of chemistry, methods for determining atomic and molecular masses, atomic structure, basic principles of quantum mechanics, quantum numbers, Pauli, Hund and Klechkovsky rules	
4	**Anatomy and morphology of plants**	4
	The musculoskeletal system. Internals: Digestive, respiratory systems, urogenital apparatus. Vascular system. Nervous system: central and peripheral parts of the nervous system. Autonomic (autonomic) nervous system. Senses. General cover	
5	**Invertebrate Zoology**	5
	The current state of vertebrate zoology as a complex science of the diversity of the animal world (chordates), its origin, evolution, role in the biosphere and human life. Type Chordates. General characteristics of the type. The place of chordates among other types of the animal kingdom	
6	**Анатомия человека**	4
	The musculoskeletal system. Internals: Digestive, respiratory systems, urogenital apparatus. Vascular system. Nervous system: central and peripheral parts of the nervous system. Autonomic (autonomic) nervous system. Senses. General cover	
7	**Systematics of plants**	5
	General characteristics of the five kingdoms of living organisms. The main systematic groups of plants: Kingdoms, Departments, Classes. The importance of plant classification. Kingdom of Mushrooms. Unicellular fungi - yeast. Multicellular fungi. Distinctive features of the departments: algae, bryophyte, fern-like, gymnosperms and angiosperms. Gametophyte. Sporophyte Life cycle of gymnosperms and angiosperms	
8	**Zoology of vertebrates**	5
	Invertebrate zoology is the science of animals. The place of zoology among other biological disciplines. The history of the development of zoology. Subkingdom. The simplest animals. General characteristics of protozoa, their classification. Phylogeny of protozoa. Subkingdom Multicellular animals. The origin of multicellular animals. Phylogeny and ecological radiation of invertebrates	
9	**Microbiology and biotechnology**	5
	A variety of bacteria in shape. Distribution and use of bacteria. Nodule bacteria. The importance of bacteria in nature. General scheme of the biotechnological process and products obtained in biotechnology (for medicine, industry and agriculture). Insulin production	
M-10.2	**Systems biology**	
1	Modern development of biology. Modern theory of the origin of life. The main stages of the formation of life on the planet. Forms of manifestation of	

	life. The main patterns that characterize life. Organisms of a cellular structure. The hierarchy of the living in the biosphere	
2	**Biology of individual development**	
	Periodization of ontogenesis. Gametogenesis and fertilization. Crushing, blastula formation, gastrulation, neurulation. Development of derivatives of germ layers: ectoderm, mesoderm, endoderm. Mechanism and types of cell movement (adhesion, cell repulsion, directional movements)	
3	**Inorganic chemistry**	
	Theoretical foundations of inorganic chemistry. Atomic-molecular doctrine, basic stoichiometric laws of chemistry, methods for determining atomic and molecular masses, atomic structure, basic principles of quantum mechanics, quantum numbers, Pauli, Hund and Klechkovsky rules	
4	**Structural botany**	
	Distinctive features of plant organization. Plant morphology as a science. Morphological evolution of higher plants. Cell. Organization of plant cells. Plastids, chemical composition of vacuoles, storage substances, shell structure. Fabrics. Vegetative organs of plants. Reproduction and reproduction	
5	**Entomology**	
	Historical aspects of the development of entomological science. Insect morphology. Anatomy and physiology of insects. Biology of reproduction and development of insects. Metamorphosis types, egg structure and types of egg-laying.	
6	**Human biology**	
	The position of man in nature. Theories of human origin and evolution. The levels of organization of the human body as an integral biological system. General overview of the human body. The levels of organization of the human body. Skin, its structure and function	
7	**Workshop on botany**	
	The main classes of archegonial and flowering plants. Basic methods of work in the laboratory. Working with determinants. Drawing up keys, dichotomous schemes. Higher plants. Spore plants. Seed plants. Division Gymnosperms. Systematic review of gymnosperms. Department of Flowering or Angiosperms	
8	**Workshop on Zoology**	
	Basic techniques for working with invertebrates in the laboratory. Methods of their content. Mounting invertebrates. Collecting. Methods for opening and isolating internal structures. Working with determinants. Methods and rules for collecting animals, as well as methodological features of collecting material by class	
9	**Medical microbiology**	
	The main goals and objectives of medical microbiology. The concept of the epidemic process. Microflora of the human body. Microbial decontamination methods in the prevention of infectious diseases. The concept of infection. The nature of the interaction of a microorganism with a macroorganism. Features of viral infections	
10	**Educational-practice**	6
	Practice provides an opportunity to expand and deepen knowledge of botany and zoology. Practice not only complements the materials of training courses and contributes to mastering the methods of field observation, future teachers should have a visual idea of many natural phenomena, without which the integral worldview of a modern biologist is impossible.	

11	**Teaching practice**	8
	Acquaintance with the pedagogical process of the school (with the work plans of the school, subject teacher, class teacher). Drawing up a short-term lesson plan, flow charts for lessons. Organization and conduct of biology lessons of different types using various pedagogical technologies and teaching methods. Organization of various types of independent work of students and assessment of their pedagogical effectiveness	
PD 3	**CYCLE OF PROFILING DISCIPLINES**	
M-13.1	**Molecular biology**	5
1	Nucleic acids. Deoxyribonucleic acid (DNA) molecule structure. DNA structure (primary and secondary strands). DNA functions. Transcription. RNA processing. Splicing and its types. Structure and function of ribonucleic acid (RNA). Matrix RNA. Ribosomal RNA. Transport RNA. Basic genetic mechanisms. RNA and protein synthesis. DNA repair mechanisms	
2	**Theory and development of the organic world**	3
	The modern theory of evolution. Speciation concept. The role of variability in the evolutionary process. The driving forces of evolution. Natural selection, its forms. Gene drift. Population waves. Isolating mechanisms. Evolution proof. The fitness of organisms. Definition of the concept of "species". View structure. Hypotheses of the formation of the solar system and planet earth	
3	**Neurophysiology**	3
	The structure of the nerve cell, synapses. The structure of the central nervous system (structure and function of the spinal cord and brain). Conditioned and unconditioned reflexes. Inhibition of conditioned reflexes. Coordination of the body. Functional systems. Types of higher nervous activity. Memory, types of memory. Sleep, the nature of dreams	
M-13.2	**Molecular basis of biological processes**	
1	The most important chemical components of the cell (proteins, carbohydrates, nucleic acids, lipids) and levels of their structural organization, the basics of biocatalysis, enzymes and coenzymes, biological membranes and membrane transport, the basics of matrix synthesis of biopolymers (replication, transcription, translation), mutations, genetic engineering, etc. biotechnology, polymerase chain reaction	
2	**The teaching of evolution**	
	Modern theory of evolution. The concept of speciation. The role of variability in the evolutionary process. Driving forces of AI evolution. Natural selection, its forms. Genetic drift. Population waves. Isolation mechanisms. Evidence for evolution. Fitness of organisms. The definition of "species". Structure of the view. Hypotheses of the formation of the solar system and the planet earth.	
3	**Physiology of adaptation**	
	Classification and characteristics of adaptive mechanisms. The mechanism of development of resistance and exclusion. Adaptation of the body to various environmental factors	
4	**Internship**	5
	Systematization, consolidation and expansion of theoretical and practical knowledge obtained in the course of training. Implementation of the experience of independent development of training sessions.	