



**MINISTRY OF EDUCATION AND SCIENCE OF THE
REPUBLIC OF KAZAKHSTAN**

**ABAY KAZAKH NATIONAL PEDAGOGICAL
UNIVERSITY**

Approved

At the meeting of the Scientific and
methodological Council of KazNPU.

Abai's

Chairman RMC

Rector _____ T. Balykbayev

Protocol № ____ от «__» ____ 2019y

CATALOGUE OF ELECTIVE DISCIPLINES

Specialty 6B01512- Training of teachers in natural sciences (Chemistry and biology)

2019/2020 school year

**INSTITUTE OF NATURAL SCIENCE AND GEOGRAPHY
DEPARTMENT OF CHEMISTRY**

Almaty, 2019

CATALOG OF ELECTIVE DISCIPLINES

Bachelor's Level

In the specialty 6B01512- Training of teachers in natural sciences (Chemistry and biology)
2019/2020 academic year

Cycle of disciplines	Name of disciplines and their main sections	(ECTS)
SC 1.2	SELECTION COMPONENT (SC)	5
	Basis of the economy and business	
	Social production. The essence, form, structure of capital. Production costs. Production incomes in a market economy. Business concept. Types of business activities. Theory of ownership, social forms of management. Goods, money. Social and economic system. The emergence of the market. Financial system. The role of the state in business development. Macroeconomics. Resource Saving. Cyclical economic development. Inflation and unemployment. Kazakhstan in the system of world economic relations.	
	Bases of the law and anti-corruption culture	
	Fundamentals of law and anti-corruption culture The main provisions of the Constitution, the current legislation of the Republic of Kazakhstan; the system of government, the 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 of substantive and procedural law; the nature of corruption, the reasons for its origin; measure of moral, legal responsibility for corruption offenses; current anti-corruption legislation	
	Health and safety of the person	
	Life safety, its main provisions. Hazards, emergency situations. 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 ensuring life safety, and legal regulation of their activities	
	Ecology and sustainable development	
	The main laws governing the functioning of living organisms, ecosystems of various levels of organization, the biosphere as a whole, and their stability; the interaction of the components of the biosphere and the environmental consequences of human activities, especially in conditions of intensification of environmental management; modern ideas about the concepts, strategies and practical tasks of sustainable development in various countries and Kazakhstan; problems of ecology, environmental protection, sustainable development	
1.	Management in education and electronic documentation	5
	Scientific and methodological bases of pedagogical management. Intra-school management. Regularities and principles of management at school. Functions and methods of pedagogical management. Information technologies in management. Leadership style. Ethics and culture of management. Marketing. The competitiveness of the educational organization. Electronic log book of classes, automatic distribution of classes, completed documents and reports monitoring visits to teachers and students of others.	
2.	Inclusive education	5
	The role of inclusive education in social and educational policy. Legal support,	

	models, forms, types of inclusive education. Psychological and pedagogical problems of teaching and education of children with disabilities in inclusive education. Psychological and pedagogical technologies of work with children with disabilities and their families. Interaction with teachers and psychologists in the organization of inclusive education	
3.	Pedagogical measurements	5
	Modern means of evaluation of learning outcomes. The problem of valuation activity. The model of technology based assessment. Principles of evaluation. Stages and tools of evaluation. Criteria table – the subject heading. Formative assessment and summative (internal and external) assessment. Moderation of summative assessment results. Age criteria for the evaluation of educational outcomes. Self-esteem and mutual evaluation with peers. Pedagogical tasks of the portfolio. Functions and composition of the portfolio.	
4	Student teaching	4
	To acquaint students with the activities of teachers-psychologists in various educational organizations. Familiarization with pedagogical and psychological technologies. The study of the psychological climate and relationships in the educational environment. Study and generalization of the experience of honored teachers-psychologists.	
5	Inorganic chemistry I	6
	Theoretical foundations of inorganic chemistry. Atomic and molecular doctrine, basic stoichiometric laws of chemistry, methods for determining atomic and molecular masses, the structure of the atom, the basic principles of quantum mechanics, quantum numbers, Pauli, Hund and Klechkovsky rules, Periodic law and Periodic system, chemical bonding, valence bond theory, molecular orbital theory, concepts of hybridization of orbitals, molecular structure theory, crystal field theory; solutions, theory of electrolytic dissociations, hydrolysis of salts, redox reactions, basic concepts of the theory of coordination compounds.	
6	Inorganic chemistry II	6
	Hydrogen, production, properties, practical application. General characteristics of s-elements. Alkaline, alkaline earth metals, preparation, properties, important compounds, application. General characteristics of p-elements. Aluminum, carbon, silicon, nitrogen, phosphorus, sulfur, Halogens, preparation, properties, important compounds, application. General characteristics of d-elements. Chromium, manganese, iron, copper, zinc, important compounds, application. f-elements, radioactivity, industrial use in science and technology. Production of metals and their alloys in Kazakhstan.	
9	Organic chemistry I	6
	Theoretical foundations and history of organic chemistry; Electronic points of view in the theory of the structure of organic molecules. A series of acyclic hydrocarbons. Alkanes. Alkyls. Alkynes. Alkadienes. Halogen derivatives of hydrocarbons. Haloalkane. Nitro compounds and Amines of alphabetical series. Alkanols (derivatives of hydroxy hydrocarbons, alcohols). Aldehydes and ketones (oxides of hydrocarbons). Monocarboxylic acids. Carboxylic acid derivatives. Dicarboxylic acid. Oxy-carboxylic acids.	
10	Organic chemistry II	6
	Carbohydrates. Monosaccharides. Oligosaccharides, polysaccharides. Alicyclic series of hydrocarbons. Aromatic aldehydes and ketones. Aromatic acids. Aromatic amines. Aromatic diazo and azo compounds. Benzene rings are non-condensed multi-core aromatic carbohydrates. Multinuclear aromatic hydrocarbons of condensed benzene rings. Heterocyclic compound. Six-membered and five-membered heterocycles.	

11	Colloid chemistry	3
	The main stages of the development of colloidal chemistry. Classification and nature of disperse systems. Molecular-kinetic and rheological properties of colloidal systems. Optical properties of colloidal systems. Surface phenomena. Surface activity. Dulong-Traube rules. Adsorption at the interface between liquid-gas and liquid-liquid separation. Adsorption in solid adsorbent. Electrokinetic phenomena. Methods for the preparation and purification of a colloidal solution. Stability and coagulation of colloidal systems. Coagulation of hydrophobic sols. Coagulation by electrolytes. Schulze-Hardy rules. Separate classes of colloidal systems. Surfactants (surfactants) classification and general characteristics. Microheterogeneous systems. Aerosols. Powders. Semi-colloids. Soap. Suspension. Emulsion. Foam.	
	Botany I	
	Anatomy and morphology of plants. The position of plants in the system of the organic world. Plant cell. Plant tissue. Root and root systems. Escape. Reproduction and reproduction of plants.	
	Botany II	
	Subject and methods of taxonomy of lower plants. Systematics, classification, nomenclature. A variety of structure, lifestyle and nutritional characteristics of lower plants. Prokaryotes and eukaryotes. Levels of plant organization: precellular, cellular and tissue. Classification of the plant world. Know the classification of plant systems and the principles of their construction; have an idea of the reproduction and reproduction cycles of the most significant groups of lower and higher plants; be able to distribute them among taxonomic groups - genera, families, orders, classes and departments; know the evolution of the most important taxa, the origin and evolution of holo- and angiosperms, their distribution and practical significance.	
	Zoology I	
	History and development of Zoology. System of the animal world. General characteristics of protozoa. Structure, reproduction and life cycles sarcomastigophora, ciliates, sporozoa. Origin and classification of multicellular. The structure of the lamellar and sponge. Classification of radially symmetric animals. Features of the structure and development of coelenterates. Classification of bilateral animals. Types of flatworms. Roundworm. Classification, structure, development. Annelida. Mollusca. General characteristics of arthropods. Structure of gills (Branchiata). General characteristics of chelicerata (Chelicerata). External and internal structure of arachnids and crustaceans. Reproduction and development of insects. General characteristics of the second-mouthed. Structure of echinoderms. Embryonic and post-embryonic development of echinoderms. The main stages of phylogenetic development of the animal world.	
	Zoology II	
	Patterns of development of science and the main stages. Classification of animals. The basic principles of the macrosystem. Characterization of animal organization levels: cellular, tissue. Systematics, structure, ontogenesis, ecology of 23 types. Origin of chordates and their classification. Characteristic of the chordate type, subtypes: scabulous and vertebral. The subject and methods of vertebrate zoology. Origin of chordates and their classification. Characteristic of the chordate type, subtypes: scabulous and vertebral. The characteristic morphological and biological features of various animal groups, to trace the degree of increase in their organization and analyze the material studied, to identify the most explain phylogenetic relationships, as well as family relationships between them, to master the basic methods of scientific research and the choice of objects to study, to get basic concepts about taxonomic units, mainly focusing on the local fauna; work with educational and scientific literature; independently conduct excursions, observe animals in natural and laboratory conditions, set up experiments.	

7	Analytical chemistr I	5
	Theoretical bases of analytical chemistry; classification, types of analyses. Methods of qualitative analysis. Sensitivity of analytical reaction. Minimum definition. The law of the masses. Basic concepts of the theory of electrolytic dissociation. The ionic product of water. The theory of strong electrolytes. Activity. Activity coefficient. Ionic strength of solution. Protolytic theory of acids and bases, calculation of pH solutions. Buffer solution. Application of the law of masses in the hydrolysis process. Amphoteric processes in qualitative analysis. Equilibrium in heterogeneous systems. Solubility. Factors affecting solubility, influence of homogeneous forces. Redox processes. The essence of complex compounds in analytical chemistry. Qualitative analysis of cations. Qualitative anion analysis.	
8	Analytical chemistr II	5
	Principles of quantitative analysis. Classification of quantitative analysis methods. The essence of gravimetric analysis. The essence of titrimetric analysis and its application. Methods of acid-base titration. Methods of redox titration. Deposition method. Complexometric titration.	
	Physical chemistry	
	Basic concepts of thermodynamics. Thermodynamic theory of solutions. Thermodynamic properties of ideal solutions. Solid - liquid equilibrium of the solution. Formal kinetics. Theories of chemical kinetics. Simple and complex reactions. The effect of temperature on the reaction rate. Activation energy. Catalysis. Homogeneous, heterogeneous catalysis. Electrochemistry. Electrolyte solutions. Electrical conductivity of electrolyte solutions. Electrochemical circuits (galvanic cells).	
4	Chemical technology	4
	Chemical technology. Production processing of inorganic substances. Raw materials, energy, water. Problems of nature protection. Sulphuric acid production. Ammonia synthesis. Nitric acid production. Electrochemical and electrothermal production. Production of iron and steel. Fuel treatment. Basic organic synthesis. Oil processing. Chemical fiber. Polymer production	
	Chemical ecology	
	Fundamentals of chemical ecology and environmental problems. Basic concepts and criteria for the study of matter. Chemical bases of transformation of pollutants in natural environments. Ecology of organic compounds. Radioactive contamination. Chemical ecology of the atmosphere. Chemical components of the atmosphere. Chemical ecology of hydrosphere. Heavy metal. Chemical ecology of the lithosphere. Biogeochemical cycle. Technology of industrial wastewater treatment. Ecology and energy. Environmental monitoring.	
	Human anatomy and morphology	
	Subject and research methods. Musculoskeletal system: Osteology. Artology. General myology. Splanchnology: Digestive System. Respiratory system. Output system. Reproductive system. Endocrinology. Angiology: blood circulatory system. Lymphatic system. Neurology: Central nervous system. Autonomic nervous system. Analyzers (sensor systems).	
9	Human and animal physiology	4
	Subjects and methods of studying physiology. Cell physiology. Physiology of excitation organisms. Physiology of neuro-motor circuits. Physiology of nervous system. The brain's integral function. Physiology of Sensory Systems. Physiology of endocrine system. Dissociation physiology. Blood Physiology. Physiology of blood circulation. Respiratory Physiology. Digestion physiology. Metabolism and energy. Physiology of the extraction system.	
10	Biochemistry	4

	The main biological compounds that are important for the life of the body: amino acids, proteins and peptides, nucleotides, nucleic acids, carbohydrates, lipids, coenzymes. Energy exchange. ATP, methods for the synthesis of ATP. Monofunctional bioorganic compounds: alcohols, aldehydes, ketones. Classification. Development. Objects of bioorganic chemistry research. Functional groups and homologs of bioorganic compounds. Biopolymers and their structural components. Low molecular weight bioregulators. Types of bioorganic reactions.	
11	Genetics and selection	3
	The subject and tasks of genetics. The main stages of development. Methods of genetic research. The material basis of heredity. Mechanisms of reproduction of prokaryotes. Cell cycle. Mitosis as a mechanism of asexual reproduction in eukaryotes. Cytological basis of sexual reproduction. Patterns of inheritance of characters and principles of heredity. Inheritance with mono- and poly hybrid crossbreeding. Inheritance in the interaction of genes. Selection Methods.	