

МИНИСТЕРСТВО НАУКИ И ВЫСШЕГО ОБРАЗОВАНИЯ РОССИЙСКОЙ ФЕДЕРАЦИИ

**ФЕДЕРАЛЬНОЕ ГОСУДАРСТВЕННОЕ БЮДЖЕТНОЕ ОБРАЗОВАТЕЛЬНОЕ
УЧРЕЖДЕНИЕ ВЫСШЕГО ОБРАЗОВАНИЯ
«СЕВЕРО-КАВКАЗСКАЯ ГОСУДАРСТВЕННАЯ АКАДЕМИЯ»**

УТВЕРЖДАЮ:

И.о. проректора по учебной работе,

к.п.н., доцент

Нагорная Г.Ю./

2023 г.



Программа

вступительного испытания по предмету «Биология (с включенным
английским)» для абитуриентов

Черкесск, 2023

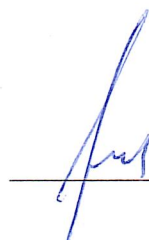
Программа вступительного экзамена одобрена
на заседании кафедры «Биология» от «20» сентября 2023 г. Протокол № 2

Заведующий кафедрой «Биология»

 Айбазова Ф.У


Программа вступительного экзамена одобрена Советом Медицинского
института от «18» октября 2023 г. Протокол № 2

Председатель Ученого Совета
Медицинского института СКГА

 Узденов М.Б.

Разработчики:

Доцент кафедры «Биология», к.б.н.

 Айбазова Ф.У.

Согласовано:

Заместитель председателя ПК к.э.н., доцент

 Акбаева Ф.А.

THE MINISTRY OF AND HIGHER EDUCATION OF THE RUSSIAN
FEDERATION

Federan State Budgetary Educational Institution of Higher Education
«North Caucasian State Academy»

APPROVED:

Vice – rector for academic work,

PhD in Pedagogy

assistant professor

_____/Nagornay G.Y/

« ____ » _____ 2023 г.

PROGRAM

of Biology Entrance Test
for Applicants entering based on
higher and secondary education

Cherkessk – 2023

**Indicators and criteria of the entrance test result,
assessment scale and procedure
"Biology"**

When completing the tasks of the entrance test in biology, the applicant must show:

- the formation of a system of knowledge about general biological laws, laws, and theories;

- formation of knowledge about the role and place of biology in modern scientific research

картине understanding the role of biology in shaping кругозора a person's functional literacy outlook for solving practical problems;

- a strong command of basic biological concepts, terms and symbols;

- the formation of skills to study and analyze biological objects and systems, explain the laws of biological processes , etc.

явлений; predict the consequences of significant biological research;

- knowledge of methods of independent formulation of biological experiments, description, analysis, explanation of the result and assessment of the reliability of the result, solving biological problems.

Structure of the discipline

Section 1. Biology as a science. Methods of scientific cognition

Section 2. The cell as a biological system

Section 1. Biology as a science. Methods of scientific cognition

Section 2. The cell as a biological system

Section 3. The organism as a biological system

Section 4. Genetics

Section 5. System and diversity of the organic world

Section 6. The human body and its health.

Section 7. Evolution of wildlife

Section 8. Ecosystems and their inherent patterns

Section 1. Biology as a science. Methods of scientific cognition

1.1. Biology as a science, its achievements, methods of cognition of living nature. The role of biology in shaping the modern natural science picture of the world. The importance of biology for medicine.

1.2. Main levels of wildlife organization: molecular-genetic, cellular, organizational, population-specific, biogeocenotic, biosphere.

1.3. Biological systems. Common features of biological systems: features of chemical composition, metabolism and energy conversion, homeostasis, irritability, movement, growth and development, reproduction, evolution.

Section 2. The cell as a biological system

2.1. Modern cell theory. Development of knowledge about the cell. The cellular structure of organisms is the basis for the unity of the organic world, proof of the kinship of living nature.

2.2. Prokaryotes and eukaryotes. Cell structure and functions: membranes, nucleus, cytoplasm, its organoids and inclusions. Diversity of cells. Comparative characteristics клеток of plant, animal, bacterial, and fungal cells. The interrelation of the structure and functions of parts and organoids of a cell is the basis of its integrity.

2.3. Chemical composition of the cell. Water and other inorganic substances, their role in cell life. Organic substances: carbohydrates, lipids, proteins, and nucleic acids. Biopolymers. Enzymes, their role in the processes of vital activity.

2.4. Metabolism and energy conversion-the basis of cell life. Energy exchange and plastic exchange, their interrelation. Stages of energy metabolism. Fermentation and respiration. Photosynthesis and its significance. Chemosynthesis.

2.5.5. Genetic information in the cell. DNA replication. Genes, the genetic code and its properties. Transcription of DNA. Translation of mRNA. The process of protein synthesis.

2.6. Cell life cycle. Cell division. Preparation of cells for division. Mitosis and meiosis, characteristics of their phases. Development of germ cells in plants and animals. Significance of mitosis and meiosis.

Section 3. The organism as a biological system

3.1. Diversity of organisms: unicellular and multicellular; autotrophs, heterotrophs, aerobes, anaerobes.

3.2. Reproduction of organisms, its significance. Methods of reproduction, similarities and differences between sexual and asexual reproduction. The structure of germ cells. Fertilization in animals and plants. Its types and characteristics.

3.3. Ontogenesis and its types. Embryonic and postembryonic development of organisms. Causes нарушения of developmental disorders of organisms.

Section 4. Genetics

4.1. Genetics and its tasks. Heredity and variability are properties of organisms. Methods of genetics. Basic genetic concepts and symbols. Modern ideas about the gene and genome.

4.2. Patterns of heredity, their cytological bases. Dominant and recessive traits. Allelic genes. Phenotype and genotype. Homozygote and heterozygote. Patterns of inheritance established by G. Mendel, their cytological bases (mono -, di- and polyhybrid crosses).

T. Morgan's laws: linked inheritance of traits, gene linkage disorder.

Genetics of gender. Inheritance of gender-linked, gender-restricted, and gender-controlled traits. Genotype as an integrated system. Interaction of allelic and non-allelic genes. Pleiotropic effect of the gene. Lethal alleles.

Human genetics. Methods of studying human genetics. Solving genetic problems. Drawing up crossbreeding schemes.

4.3. Patterns of variability. The role of genotype and environmental conditions in phenotype formation. Non-hereditary (modification) variability. Reaction rate. Statistical patterns of modification variability. Hereditary variability: mutational, combinative. Types of mutations and their causes. The importance of variability in the life of organisms and in evolution.

4.2. Selection, its tasks and practical significance. N. I. Vavilov's contribution to the development of breeding: the doctrine of the centers of diversity and origin of cultivated plants, the law of homologous series in hereditary variability. Breeding methods and their genetic bases. Methods of breeding new plant varieties, animal breeds, and microbial strains. The importance of genetics for breeding. Biological bases of cultivation of cultivated plants and domestic animals.

Section 5. System and diversity of the organic world

5.1. Diversity of organisms. The significance of the works of C. Linnaeus and J. B. Lamarck.

The main systematic (taxonomic) categories: species, genus, family, order (order), class, type (department), kingdom; their subordination in plants and animals.

5.2. Viruses are a non-cellular form of life. Features of their structure and vital activity. Medical significance of viruses. Measures to prevent the spread of viral diseases.

5.3. The Kingdom of Bacteria. Structure, vital activity, reproduction, role in nature, сельском agriculture, industry, and medicine. Bacteria are pathogens of diseases of plants, animals, and humans. Prevention of diseases caused by bacteria.

5.4. The Kingdom of Mushrooms. Structure, vital activity, reproduction. Mold fungi. Yeasts. Fungi are parasites. The role of fungi in nature and agriculture. Use of mushrooms for obtaining food and medicine. Recognition of edible and poisonous mushrooms. Lichens, their diversity, features of structure and vital activity. Role of fungi and lichens in nature.

5.5.5. The Kingdom of the Plant. Botany is the science of plants. Plant tissues (educational, mechanical, integumentary, conducting, basic, excretory). Features of their structure and functioning, position in the plant. Vegetative organs of plants: root, shoot, stem, buds, leaf. Their structure, functioning, significance in *жизни* plant life, and modifications. Generative organs of plants: flower, seed, fruit. Their structure, functioning, and significance in plant life. Photosynthesis and its significance for plants. Vegetative and sexual reproduction of plants.

5.6 Diversity of plants. Spore plants – algae (green, brown, red), mosses (green, white, liverwort), ferns, horsetails, plowshares. Seed plants. Structure and reproduction of gymnosperms and angiosperms. Monocotyledonous and dicotyledonous plants and their families – features of structure, vital activity, economic and medical significance.

5.7 Kingdom of Animals. Zoology is the science of animals. Unicellular and multicellular animals. Unicellular: general characteristics, habitat, movement, nutrition, respiration, excretion, reproduction, encysting. Taxonomy, origin, diversity, and significance of unicellulars.

Protozoa are human parasites and their life cycles.

5.8. Flatworm type. General characteristics. Habitat, external and internal structure. Food. Breath. Highlighting. The nervous system. Reproduction. Regeneration. Free-living and parasitic flatworms. Taxonomy, origin, diversity, and significance of flatworms. Flatworms are human parasites and their life cycles. Adaptations to a parasitic lifestyle.

5.9. The roundworm type. General characteristics. Habitat, external and internal structure. Food. Breath. Highlighting. The nervous system. Reproduction. Taxonomy, origin, diversity, and significance of roundworms. Roundworms are human parasites and their life cycles. Adaptations to a parasitic lifestyle.

6. Type Annelid worms. General characteristics. Habitat, external internal structure. Food. Breath. Highlighting. The nervous system. Reproduction. Taxonomy, origin, diversity, and significance of annelids.

6.1. Type of Shellfish. General characteristics. Habitat, external and internal use

internal structure. Food. Breath. Highlighting. The nervous system. Reproduction. Taxonomy, origin, diversity, and significance of Mollusks.

6.2. Type Arthropods. General characteristics. Classes Crustaceans, Arachnids, and Insects – habitat, external and internal structure. Food. Breath. Highlighting. The nervous system. Reproduction. Orders of insects with complete and incomplete transformation. Taxonomy, origin, diversity and significance of arthropods, their role in agriculture. Medical significance of Arachnids and Insects.

6.3. The Chordal type. General characteristics. The Lancelet class. The lancelet is the lowest chordate animal. *Среда* Living environment. External structure.

Chord. Features of the internal structure. Similarity of lancelets with vertebrates and invertebrates. Taxonomy of the Chordates type.

6.3. Superclass of Fish (Class Cartilaginous and class Bony fish). The Amphibian class. Reptiles class. The Bird class. The Mammals class. General

characteristics of classes. External and internal structure. Living environment. Adaptations to cope the environment and образы lifestyle. Reproduction and development. Diversity of animals of different classes, taxonomy within classes, and morphophysiological features. Evolution of organ systems in the Chordate type. The importance of representatives of different classes in nature and human life.

Section 6. The human body and its health

6.1. Human anatomy, physiology and hygiene - sciences that study the structure and functions of the human body and the conditions for maintaining its health.

6.2. Tissues (epithelial, muscular, nervous, connective) and their varieties. Reflex in humans. Reflex arcs.

6.3.3. The musculoskeletal system. Composition, structure and growth of bones. Types of bones. Joints of bones: immobile, semi-mobile, joints. Human skeletal structure: axial skeleton, upper and lower limb girdle, free limb skeletons. Muscles, their structure and functions. Nervous regulation of muscle activity. Joint movements. Muscle work. Influence of rhythm and load on muscle function. Muscle fatigue. The importance of physical exercises for the proper formation of the skeleton and muscles. Prevention of curvature of the spine and development of flat feet. The value of the musculoskeletal system.

6.2. Tissues of the internal environment of the body: blood, lymph, tissue fluid. Relative constancy of the internal environment. Blood composition: plasma, shaped elements. Blood types. Meaning of blood transfusion. Blood clotting as a protective reaction. Red blood cells and white blood cells, their structure and functions. Anemia. I. I. Mechnikov's teaching on the protective properties of blood. Immunity, its types. Vaccines and serums. Fight against epidemics.

6.3. The circulatory system. Circulatory organs: the heart and blood vessels (arteries, capillaries, veins), their structure and functions. Large and small circulatory circles. The heart, its structure and work. Automatism of the heart. Movement of blood through the blood vessels. Pulse rate. Blood pressure. Nervous and humoral regulation of the heart and blood vessels. The importance of blood circulation for the body. Hygiene of the cardiovascular system.

6.4. Respiratory system. Respiratory organs, their structure and functions. Breathing movements. Concepts of vital lung capacity. Stages of breathing. A voice box. Nervous and humoral regulation of respiration. The importance of respiration for the body. Respiratory hygiene.

6.5. Digestive system and обмен metabolism. Structure органов of the digestive system. Digestion in the oral cavity. Swallowing. I. P. Pavlov's works on the study of salivary gland activity. Digestion in the stomach. Works of I. P. Pavlov on the study of digestion in the stomach. Liver, pancreas and their role in digestion. Digestion in the intestines. Suction. Nervous and humoral regulation of the digestive system. The role of enzymes in digestion. Nutrients, vitamins and food products. Food hygiene. Basic metabolism, general metabolism, water-salt, protein, fat and carbohydrate metabolism. Regulation of metabolism (carbohydrate, fat, protein,

water-salt). Metabolism between the body and the environment. Nutrition standards. The importance of proper nutrition. Vitamins and their importance for the body.

6.6. Urinary system. Structure of urinary system organs, their functions. Formation of primary and secondary urine. Urination. Nervous and humoral regulation of the urinary system. Significance of metabolic product excretion.

6.7. Skin. Structure and functions of the skin. Skin receptors. The role of the skin in thermoregulation processes. Skin and clothing hygiene. Mechanisms of thermoregulation in the human body.

6.8. The nervous system. Central and peripheral nervous systems.

The concept of somatic and autonomic nervous systems. Types of nerve fibers. Structure and functions of the spinal cord and brain. Significance of the cerebral cortex. The importance of the nervous system in the vital activity of the body.

6.9. Analyzers. General principles of structure and functioning of analyzers. Visual, auditory, olfactory, vestibular, gustatory, tactile analyzers. Structure and functions of the visual organs. Visual hygiene. Structure and functions of the hearing organ. Hearing hygiene. The importance of analyzers in the vital activity of the body.

7. Higher nervous activity. Unconditional and conditioned reflexes. Formation and biological significance of conditioned reflexes. Inhibition of conditioned reflexes. The role of I. M. Sechenov and I. P. Pavlov in the creation of the theory of higher nervous activity. The essence of the doctrine of higher nervous activity, its essence. I. P. Pavlov's teaching on signal systems. Speech, types, and functions of speech. Human consciousness, thinking, memory and emotions as functions of the higher parts of the brain. Types of temperament. Features of the human psyche. Hygiene of physical and mental work. Mode of work and rest. The dream, its meaning.

7.1. Железы Endocrine glands, their features. Characteristics of hormones, their differences from other biologically active substances, mechanism of action. The role of hormones in the humoral regulation of body functions. Changes in humoral regulation in hypo- and hyperfunction of the endocrine glands. The importance of the endocrine glands in the vital activity of the body.

7.2. Development of the human body. Reproduction of organisms. Sex glands and germ cells. Fertilization. Human embryonic development, characteristics of its early periods. Features of postnatal development of the human body in different age periods.

Section 7. Evolution of wildlife

7.1. The type and its criteria. Population is a structural unit of a species and an elementary unit of evolution. Population characteristics. Population genetics.

7.2. Driving forces of evolution, their interrelation. Mutations as material for artificial and natural selection. Natural selection, its forms, types of struggle for existence. Microevolution. Formation of new species. Methods of speciation. Results of evolution: adaptability of organisms to the environment, diversity of species. Macroevolution. Formation of supraspecific rank taxa. Directions and ways

of evolution (according to A. N. Severtsov, I. I. Schmalhausen): biological progress and regression, aromorphosis, idioadaptation, degeneration. Causes of biological progress and regression. Evidence for the evolution of wildlife.

Section 8. Ecosystems and their inherent patterns

8.1.. Subject and objectives of ecology. Habitats of organisms and adaptations to them. Environmental factors: abiotic, biotic, anthropogenic factors. Their meaning. The rule of optimum and limiting factors.

8.2. Ecosystem (biogeocenosis), its components: producers, consumers,, reducers,, their role. Specific and spatial structures of the ecosystem. Trophic levels. Power supply chains and networks, their links. Rules of the ecological pyramid. Drawing up schemes for the transfer of substances and energy (power supply chains). Ecological characteristics of the species. Factors that cause changes in the population size, methods of its regulation.

8.3. Diversity of ecosystems (biogeocenoses). Self -development and смена ecosystem change. Sustainability and dynamics of ecosystems. Biological diversity, self-regulation and circulation of substances are the basis for sustainable ecosystem development. Causes of ecosystem sustainability and change. Changes in ecosystems under the influence of human activity. Agroecosystems, their main differences from natural ecosystems.

8.4.4. The biosphere and its borders. V. I. Vernadsky's Teaching on the biosphere. Living matter, its functions. Biological cycle transformation of energy in the biosphere, the role of organisms of different kingdoms in it. Evolution of the biosphere.

Recommended literature:

General biology: a textbook for 10-11 grades of secondary school / [D. K. Belyaev, A. O. Ruvinsky, N. N. Vorontsov et al. ed. by D. K. Belyaev, A. O. Ruvinsky. - Moscow: Prosveshchenie Publ., 1991-270, [1] p.: ill.; 22 cm.; ISBN 5-09-003365-X..

Korchagina, Vera Aleksandrovna. Biology: Plants, bacteria, fungi, lichens: Textbook for 6-7 class environments. shk. / V. A. Korchagina. - 24 ed. - Moscow, 2002-256 p.: tsv. il.; 21 cm.; ISBN 5-901860-24-1

Mustafin, Alexander Gazisovich. Biology: for school graduates and those entering universities: a textbook for the group of specialties and professions "Healthcare" of secondary professional education / A. G. Mustafin; edited by Professor V. N. Yarygin. - 23rd ed., ster. - Moscow: Knorus, 2021-584 p.: ill., tab.; 21 cm.; ISBN 978-5-406-08009-2.

Unified State Exam. Biology: typical exam options: 30 options / V. S. Rokhlov, N. V. Kotikova, V. B. Salenko, A. A. Maksimov; edited by V. S. Rokhlov. Moscow: Nats. obrazovanie, 2021 -366 p.: ill., tab.; 28 see - (Project with the participation of developers of the Unified State Exam CMM) (USE. FIPI - school); ISBN 978-5-4454-1432-2

Unified State Exam. Biology: training and typical exam options: 30 options / V. S. Rokhlov, N. V. Kotikova, V. B. Salenko, A. A. Maksimov; edited by V. S. Rokhlov. Moscow: Nats. Obrazovanie, 2022-367 p.: ill.; 28 cm. - (Unified State Exam 2022) (Project with the participation of developers of the Unified State Exam CMM) (New model of the Unified State Exam CMM. 30 variants) (2022. FIPI-school); ISBN 978-5-4454-1530-5