

МИНИСТЕРСТВО НАУКИ И ВЫСШЕГО ОБРАЗОВАНИЯ
РОССИЙСКОЙ ФЕДЕРАЦИИ
ФЕДЕРАЛЬНОЕ ГОСУДАРСТВЕННОЕ БЮДЖЕТНОЕ
ОБРАЗОВАТЕЛЬНОЕ УЧРЕЖДЕНИЕ ВЫСШЕГО ОБРАЗОВАНИЯ
«СЕВЕРО-КАВКАЗСКАЯ ГОСУДАРСТВЕННАЯ АКАДЕМИЯ»

УТВЕРЖДАЮ:

Проректор по учебной работе,

к.п.н., доцент

/ Нагорная Г.Ю./
2022 г.



ПРОГРАММА

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

**THE MINISTRY OF SCIENCE AND HIGHER EDUCATION OF THE RUSSIAN
FEDERATION
Federal State Budgetary Educational Institution of Higher Education
"North Caucasian State Academy"**

APPROVED

Vice-rector for academic work

PhD in Pedagogy,

assistant professor

Nagornaya G.Y.



2022.

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

Cherkessk – 2022

Программа вступительного экзамена одобрена

На заседании кафедры «Биология»

Медицинского института ФГБОУ ВО «СКГА»

От 21 сентября 2022 г. Протокол № 2

Заведующий кафедрой «Биология»

Медицинского института ФГБОУ ВО «СКГА»

 Айбазова Ф.У.

Программа вступительного экзамена одобрена

Советом Медицинского института ФГБОУ ВО «СКГА»

От 22 сентября 2022 Протокол №2

Директор Медицинского института

ФГБОУ ВО «СКГА», к.м.н., доцент



Узденов М.Б.

Разработчики:

к.м.н., доцент кафедры «Биология»



Смеянов В.В.

Согласовано:

Заместитель председателя ПК

к.э.н., доцент



Акбаева Ф.А.

NORTH CAUCASUS STATE ACADEMY
ENTRANCE TEST PROGRAM IN BIOLOGY FOR APPLICANTS TO THE.

The content of the entrance test

To pass the entrance exam in Biology, the applicant to North Caucasian State Academy must demonstrate:

- knowledge of the main concepts, patterns and laws on the structure, life and development of plant, animal and human organisms, and the development of living nature;
- knowledge of the structure and life of plants, animals, humans, main groups of plants; classification of animals;
- the ability to substantiate conclusions, operate with concepts while explaining natural phenomena and provide the examples from the practice of agriculture and industry, health care, etc.

I. Plants

1. Botany as the science that studies plants. The flora as an integral part of nature, its diversity, distribution on Earth. Flowering plant and its structure.
2. Seed. Seed structure (in dicotyledonous and monocotyledonous plants). Seed composition. Seed germination conditions. Seeds respiration. Nutrition and growth of the seedling. Sowing time and seeding depth.
3. Root. Development of the root from the embryonic root. Types of roots. Types of root systems (taproot and fibrous).
4. External and internal structure of the root in relation to its functions. Zones of the root. Root growth. The concept of tissue. Absorption of water and mineral salts necessary for the plant by roots. Fertilizers. Root respiration. The importance of tillage, fertilization, watering for cultivated plants. Root vegetables (root modifications). The importance of the root.
5. Leaf. External structure of the leaf. Venation. Simple and complex leaves. The arrangement of leaves. Features of the internal structure of the leaf in connection with its functions; epidermis and stomatal pores, the main tissue of the leaf, the veins. Respiration of leaves. Photosynthesis. Evaporation of water by leaves. Leaf fall. The importance of leaves for plants. The role of green plants in nature and human life.
6. Stem. The concept of shoot. Vegetative and floral buds, their structure and the arrangement on the stem. The development of the shoot from the bud. Stem growth in length. Stem branching.

Crown formation. Internal structure of woody stem in the connection with its functions: bark, cambium, sapwood, heartwood. Stem growth in thickness. Growth rings formation. The transport of mineral and organic substances along the stem. The importance of the stem. Modified shoots: rhizomes, tuber, bulb, their structure, biological and economic value.

7. Vegetative reproduction of flowering plants. Reproduction of plants through shoots, roots, leaves in nature and crop production(modified shoots, stem and root cuttings, layering, dividing of the bush, grafting). Biological and economicthe importance of vegetative reproduction.

8. Flower and fruit. Flower structure: peduncle, receptacle, perianth (calyx and corolla), stamens, pistil (pistils). Structure of the stamens and pistil. Inflorescences and their biological significance. Crossoverpollination by insects, wind. Self-pollination. Fertilization. Seed and fruit formation. The importance of flowers, fruits and seeds in nature andhuman life.

9. Plant and environment. Basic life functions of a plant organism and its relationship with the habitat.

10. Classification of flowering plants. The variety of wild andcultivated flowering plants and their classification. Elementary concepts on systematic (taxonomic) categories - species, genus, family,class. The inmortance of international plant names.

11. The Class of dicotyledonous plants. Family of cruciferous, rosaceous,legumes, nightshade, Compositae.

12. The Class of monocotyledonous plants. Family of cereals, family liliaceae.

13. Distinctive features of plants of the main families; their biological features and economic significance. Typicalcultivated and wild plants of these families. Impact of economic activities on the species diversity of flowering plants. Protection of rareplant species.Red Book.

14. The main groups of plants. Seaweed. Structure andvital activity of unicellular algae (chlamydomonas, pleurococcus,chlorella). Reproduction of algae. Filamentous algae. The importance of algae in nature and economy.

15. Mosses. Green mosses. The structure and reproduction of common haircap moss.

Sphagnummoss, features of its structure. Peat formation, its significance.

16. Horsetail. Plown. Fern. Structure and reproduction.

17. Gymnosperms. The structure and reproduction of gymnosperms (using the example of pine and spruce). The distribution of conifers, their significance in nature and economy.

18. Angiosperms (flowering plants). The fitness of angiospermsto different conditions of life on Earth and their dominance in modern flora.

19. The influence of human economic activity on speciesvariety of plants. Plant protection.

20. The development of the flora on Earth. Main steps in the development and in the increase of variety of the plant world on Earth. Creation of cultivated plants by man. Achievements of Russian scientists in breeding new varieties of plants.
21. Bacteria, fungi, lichens. Bacteria. Structure and vital activity of bacteria. The presence of bacteria in the air, soil, water, living organisms. The role of bacteria in nature, medicine, agriculture, economy and industry. Disease-causing bacteria and the fight against them.
22. Mushrooms. General characteristics of mushrooms. Cap mushrooms, their structure, nutrition, reproduction. Living conditions of mushrooms in the forest. Edible and poisonous mushrooms. Mold fungi. Yeasts. Parasitic fungi that cause plant diseases. The role of mushrooms in nature and agriculture.
23. Lichens. Lichen structure. Symbiosis. Food. Reproduction. The role of lichen in nature and economy.

II. Animals

1. Zoology is the science that studies animals. The importance of animals in nature and life of humans. Similarities and differences between animals and plants. Classification of animals.
2. Unicellular. General characteristics. Common amoeba and their habitat. Movement. Nutrition. Respiration. Excretion. Reproduction. Encysting.
3. Green euglena is a unicellular organism with the traits of animals and plants.
4. Infusoria *Paramecium caudatum* ("slipper animalcule"). Structural features and the processes of life activity. Irritability.
5. Diversity and significance of unicellular organisms. Malaria parasite - the causative agent of malaria. Eliminating malaria as a mass disease.
6. The Type of Coelenterata. General characteristics of the type. Freshwater Hydra. The habitat and external structure. Radial symmetry. Internal structure (bilayer, the types of cells). Nutrition. Respiration. Nervous system. Reflex. Regeneration. Vegetative and sexual reproduction. Marine coelenterates (polyps and jellyfish) and their significance.
7. The Type of Flatworms. General characteristics of the type. External structure. Musculature. Nutrition. Respiration. Excretion. Nervous system. Reproduction. Regeneration.
8. The Type of Roundworms. General characteristics of the type. External structure. Body cavity. Nutrition. Reproduction and development. The diversity of parasitic worms and the fight against them.

9. The Type of Annelids. General characteristics of the type. Habitat. External structure. Tissues. Musculocutaneous sac. Body cavity. Systems of digestion, blood circulation, excretion. Processes of life activity. Nervous system. Regeneration. Reproduction.
10. The Type of Molluscs. General characteristics of the type. Habitat and external structure. Features of life processes.
11. The Type Arthropods. General characteristics of the type. Class Crustaceans. Crayfish. Habitat. External structure. Reproduction. Internal structure. Digestive, circulatory and respiratory systems. Excretory organs. Nutrition, breathing, excretion. Features of the vital processes. Nervous system and senses.
12. The Class of Arachnids. Araneus spiders. Habitat. External structure. Spiderweb, its structure and importance. Nutrition, respiration, reproduction. The role of ticks in nature and their practical significance. Measures protecting humans from ticks.
13. Class Insects. Cockchafer (Melolontha). External and internal structure. Life processes. Reproduction. Development types.
14. Groups of insects with complete transformation. Lepidoptera. Cabbage butterfly. Silkworm. Sericulture. Diptera. Housefly, gadflies. Hymenoptera. Honey bee and ants. Instinct. Biological method of pest control. The Order of insects with incomplete transformation. Orthoptera. Migratory Locust – Dangerous agricultural pest. The role of insects in nature, their practical significance. The preservation of their species diversity.
15. The Type of Chordates. General characteristics of the type. The class of Lancelet. Lancelet as the lowest chordate animal. Habitat. External structure. Chord. Features of the internal structure. The similarity of lancelet with vertebrates and invertebrates.
16. The Class of Pisces (Fish). General characteristics of the class. River perch. Habitat. External structure. Skeleton and musculature. Body cavity. Digestive, circulatory, respiratory systems. Swim bladder. Nervous system and senses. Behavior. Reproduction and development. Caring for the offspring. Diversity of fish. Orders of fish: sharks, sturgeon, herring, carp, cross-finned. Economic meaning of fish. Fishing. Artificial fish farming. Pondeconomy. The influence of human activities on the number of fish. The need for the rational use of fish resources, their protection (protection of waters from pollution, etc.).
17. The Class of Amphibians. General characteristics of the class. Frog. Features of the habitat. External structure. Skeleton and musculature. Features of the structure of internal organs and vital processes. Nervous system and senses. Reproduction and development. The diversity of amphibians and their significance. The origin of amphibians.

18. The Class of Reptiles. General characteristics of the class. Sand lizard. Habitat. External structure. Features of the internal structure. Reproduction. Regeneration. The diversity of modern reptiles. The order of Squamata. The order of Turtles (Testudines). The ancient reptiles: dinosaurs, animal-toothed dinosaurs. The origin of reptiles.

19. The Class of Birds. General characteristics of the class. Dove. Habitat. External structure. Skeleton and musculature. Body cavity. Features of the internal structure and life processes. Nervous system and sense organs. Behavior. Reproduction and development. Seasonal phenomena in bird life, nesting, migrations and flights. The origin of birds. The adaptability of birds to different habitats. Birds of the parks, gardens, meadows and fields. Birds of the forest. Predator birds. Birds of swamps and coastal reservoirs. Birds of the steppes and deserts. The role of birds in nature and their significance in human life. The role of nature reserves and zoos in the conservation of rare species of birds. Attracting birds. Poultry keeping.

20. The Class of Mammals. General characteristics of the class. The domestic dog. External structure. Skeleton and musculature. Body cavities. The system of organs. Nervous system and senses. Behavior. Reproduction and development. Caring for the offspring. The Orders of mammals. Prototheria. The origin of mammals. Chiroptera: bats. Rodents. Predatory: dogs, cats. Pinnipeds. Cetaceans. Even-toed ungulates. Features of the structure of the digestive system of ruminants. The breeds of cattle. Boar. Domestic pigs. Odd-toed ungulate. Wild Horse. Domestic horse breeds. Primates. Role of mammals in nature and in human life. Influence of human activities on the number and species diversity of mammals, their protection.

III. Man and his health

1. Anatomy, physiology and human hygiene - sciences that study the structure and functions of the human body and the conditions for maintaining its health. Hygienic aspects of environmental protection.

2. General overview of the human body. General acquaintance with the body human (organs and organ systems). Basic information about the structure, functions and cell reproduction. Reflex. Brief information about the structure and functions of tissues. Tissues (epithelial, connective, muscle and nervous).

3. The musculoskeletal system. The importance of the musculoskeletal systems. The structure of the human skeleton. Bone joints: motionless, semi-movable joints. Composition, structure (macroscopic) and growth of bones in thickness. Muscles, their structure and function. Nervous regulation of the muscle activity. Joint movements. Reflex arc. Muscle work. Influence of rhythm and load on muscle work. Muscle fatigue. The importance of physical exercises for the correct

18. The Class of Reptiles. General characteristics of the class. Sand lizard. Habitat. External structure. Features of the internal structure. Reproduction. Regeneration. The diversity of modern reptiles. The order of Squamata. The order of Turtles (Testudines). The ancient reptiles: dinosaurs, animal-toothed dinosaurs. The origin of reptiles.

19. The Class of Birds. General characteristics of the class. Dove. Habitat. External structure. Skeleton and musculature. Body cavity. Features of the internal structure and life processes. Nervous system and sense organs. Behavior. Reproduction and development. Seasonal phenomena in bird life, nesting, migrations and flights. The origin of birds. The adaptability of birds to different habitats. Birds of the parks, gardens, meadows and fields. Birds of the forest. Predator birds. Birds of swamps and coastal reservoirs. Birds of the steppes and deserts. The role of birds in nature and their significance in human life. The role of nature reserves and zoos in the conservation of rare species of birds. Attracting birds. Poultry keeping.

20. The Class of Mammals. General characteristics of the class. The domestic dog. External structure. Skeleton and musculature. Body cavities. The system of organs. Nervous system and senses. Behavior. Reproduction and development. Caring for the offspring. The Orders of mammals. Prototheria. The origin of mammals. Chiroptera: bats. Rodents. Predatory: dogs, cats. Pinnipeds. Cetaceans. Even-toed ungulates. Features of the structure of the digestive system of ruminants. The breeds of cattle. Boar. Domestic pigs. Odd-toed ungulate. Wild Horse. Domestic horse breeds. Primates. Role of mammals in nature and in human life. Influence of human activities on the number and species diversity of mammals, their protection.

III. Man and his health

1. Anatomy, physiology and human hygiene - sciences that study the structure and functions of the human body and the conditions for maintaining its health. Hygienic aspects of environmental protection.

2. General overview of the human body. General acquaintance with the body human (organs and organ systems). Basic information about the structure, functions and cell reproduction. Reflex. Brief information about the structure and functions of tissues. Tissues (epithelial, connective, muscle and nervous).

3. The musculoskeletal system. The importance of the musculoskeletal systems. The structure of the human skeleton. Bone joints: motionless, semi-movable joints. Composition, structure (macroscopic) and growth of bones in thickness. Muscles, their structure and function. Nervous regulation of the muscle activity. Joint movements. Reflex arc. Muscle work. Influence of rhythm and load on muscle work. Muscle fatigue. The importance of physical exercises for the correct

formation of the skeleton and muscles. Prevention of curvature of the spine and the development of flat feet.

4. Blood. The internal environment of the body: blood, tissue fluid, lymph. The relative constancy of the internal environment. Blood composition: plasma, shaped elements. Blood groups. The importance of blood transfusion. Blood clotting as a defense reaction. Erythrocytes and leukocytes, their structure and function. Anemia. The works of I.I. Mechnikov on protective properties of blood. Fighting epidemics. Immunity.

5. Blood circulation. Circulatory organs: heart and blood vessels (arteries, capillaries, veins). Large and small circles of blood circulation. Heart, its structure and work. The Automation of the heart. The concept of nervous and humoral regulation of the activity of the heart. The movement of blood through the vessels. Pulse. Blood pressure. Hygiene of the cardiovascular system.

6. Breathing. The meaning of breathing. Respiratory organs, their structure and function. Voice apparatus. Gas exchange in the lungs and tissues. Respiratory movements. The concept of the vital capacity of the lungs. The concept of humoral and nervous regulation of breathing. Respiratory hygiene.

7. Digestion. Nutrients and Foods. Digestion, enzymes and their role in digestion. The structuredigestion organs. Digestion in the oral cavity. Swallowing. The works of I.P. Pavlov on the study of the activity of the salivary glands. Digestion in the stomach. Concept about the neuro-humoral regulation of gastric secretion. The work of I.P. Pavlov on the study of digestion in the stomach. Liver, pancreas and their role in digestion. The transformation of the nutrients in the intestines. Absorption. Food hygiene.

8. Metabolism. Water-salt, protein, fat and carbohydrate exchange. Decay and oxidation of organic matter in cells. Enzymes. Plastic and energy exchange - two sides of a single process metabolism. The exchange of substances between the body and the environment. Nutritional norm. The importance of proper nutrition. Vitamins and their importance for organism.

9. Excretion. The organs of the urinary system. Kidney function. The importance of the release of metabolic products.

10. Skin. The structure and function of the skin. The role of the skin in the regulation of heat transfer. The method to increase a non-specific resistance of the organism by using low temperature water ("Hardening"). Hygiene of skin and clothes.

11. The nervous system. The importance of the nervous system. Structure and function of spinal cord and parts of the brain: oblong, middle, intermediate, cerebellum. The concept of the autonomic nervous system. Large hemispheres of the brain. Significance of the cerebral cortex.

12. Analyzers. Sensory organs. The importance of the senses. Analyzers. The structure and function of the organs of vision. Hygiene of vision. Structure and function of the organ of hearing. Hearing hygiene.

13. Higher nervous activity. Unconditioned and conditioned reflexes. The formation and biological significance of conditioned reflexes. The braking of conditioned reflexes. The role of I.M. Sechenov and I.P. Pavlov in the creation of the doctrine about higher nervous activity; its essence. The importance of the word. Consciousness and human thinking as a function of the higher parts of the brain. The scientific and religious ideas about the soul. Hygiene of physical and mental work. Work and rest mode. Sleep, its importance. Harmful effects of smoking and drinking alcohol on the nervous system.

14. Endocrine glands. The role of the endocrine glands. The concept of hormones. The role of humoral regulation in the body.

15. Development of the human body. Reproduction of organisms. Sex glands and sex cells. Fertilization. Embryo development. Features of the development of children's and adolescent organisms.

IV. General biology

1. General biology - the subject of the basic laws of life phenomena. The importance of biology for medicine, agriculture and economy.

2. Evolutionary theory.

3. Brief information about the pre-Darwinian period of the development of biology. The main provisions of the evolutionary teachings of Charles Darwin. The importance of the theory of evolution for the development of natural sciences.

4. Criteria of the species. A population is a unit of species and evolution. The concept of varieties in plants and breeds in animals.

5. Driving forces of evolution: heredity, the struggle for existence, variability, natural selection. Main role of natural selection in evolution.

6. Artificial selection and hereditary variation as the basis of breeding of domestic animals and varieties of cultivated plants. The creation of new highly productive animal breeds and plant varieties.

7. The emergence of tools. Relative character of the fitness.

8. Microevolution. Speciation.

9. Results of evolution: the fitness of organisms, diversity of the species.

10. The use of the theory of evolution in agricultural practice and for the nature protection.

11. The evolution of the organic world.
12. Evidence for the evolution of the organic world. Main directions of evolution. Aromorphosis, idioadaptation. The ratio of various directions of evolution. Biological progress and regression. The short history of the evolution of the organic world.
13. The main aromorphoses in the evolution of the organic world.
14. The main directions of evolution of angiosperms, insects, birds and mammals in the Cenozoic era.
15. Influence of human activities on the diversity of species, natural communities, their protection.
16. The origin of humans.
17. Charles Darwin's theory on the origin of man from animals.
18. Driving forces of anthropogenesis: social and biological factors. The leading role of the laws of social life in social progress of humanity.
19. The most ancient, ancient and fossil people of the modern type.
20. Human races, their origin and unity. Anti-scientific, the reactionary nature of social Darwinism and racism.
21. Fundamentals of ecology
22. The subject and tasks of ecology, mathematical modeling in ecology. Environmental factors. Human activity as an ecological factor. The complex effect of factors on the body. Limiting factors. Photoperiodism. Species, its ecological characteristics.
23. Population. Factors causing changes in population size, ways to regulate it.
24. Rational use of the species, preservation of their diversity.
25. Biogeocenosis. The relationship of populations in the biogeocenosis. Supply chains. Rule of the ecological pyramid. Self-regulation. Change of biogeocenoses. Agroecosystems. Increasing the productivity of agroecosystems based on land reclamation, introduction of new technologies for growing plants.
26. Protection of biogeocenoses.
27. Fundamentals of the doctrine of the biosphere.
28. Biosphere and its boundaries. Biomass of land surface, World Ocean, soil. Living matter, its gas, concentration, oxidative and regenerative function. The circulation of substances and the conversion of energy into the biosphere. V.I. Vernadsky's theory on the origin of the biosphere.
29. Fundamentals of cytology
30. The main provisions of the cell theory. Cell - structural and functional unit of the living. The structure and function of the nucleus, cytoplasm and its major organelles. The features of the structure of cells of prokaryotes, eukaryotes.
31. The content of chemical elements in the cell. Water and other inorganic substances, their role in the life of the cell. Organic substances: lipids, ATP, biopolymers (carbohydrates, proteins,

nucleic acids), their role in the cell. Enzymes, their role in processes of life activity. Self-doubling of DNA.

32. Metabolism and energy conversion - the basis of life in cells. Energy metabolism in the cell and its essence. ATP value in energy exchange.

33. Plastic exchange. Photosynthesis. Ways to increase the productivity of agricultural plants. Protein biosynthesis. Gene and its role in biosynthesis. DNA code. Matrix synthesis reactions. Interrelation of processes of plastic and energy metabolism.

34. Viruses, features of their structure and activity.

35. Reproduction and individual development of organisms.

36. Cell division, meiosis and fertilization are the basis for reproduction and individual development of organisms. Preparing the cell for division. Doubling of DNA molecules. Chromosomes, their haploid and diploid set, constancy of the number and morphology of chromosomes.

37. Cell division and its importance.

38. Sexual and asexual reproduction of organisms. Sex cells. Meiosis. Egg and sperm development. Fertilization.

39. Development of the embryo (using the example of animals). Postembryonic development. The harmful effects of alcohol and nicotine on the development of the human organism.

40. The emergence of life on Earth.

41. Fundamentals of genetics

42. The main patterns of heredity and variability of organisms and their cytological basis.

43. Subject, tasks and methods of genetics.

44. Mono- and dihybrid crossing. The laws of heredity established by G. Mendel. Dominant and recessive traits. Allelic genes. Phenotype and genotype. Homozygote and heterozygote. First generation uniformity.

45. The intermediate nature of inheritance. The law of segregation. The statistical nature of the segregation phenomena. Cytological foundations of uniformity of the first generation and segregation of traits in the second generation. The law of independent inheritance and its cytological foundations.

46. Linked inheritance. The linkage abnormalities. Crossover of chromosomes.

47. Genotype as an integral historically developed system. Genetics of the gender. Chromosomal theory of heredity.

48. The importance of genetics for medicine and health care. The danger of nicotine, alcohol and other drugs for the heredity of humans.

49. The role of the genotype and environmental conditions in the formation of the phenotype.

Modification variability. Reaction norm. Statistical patterns of the modification variability.

50. Mutations, their causes. The law of homologous series in hereditary variability. The works of N.I. Vavilov. Experimental generation of mutations.
51. Mutations as material for artificial and natural selection. Contamination of the natural environment with mutagens and its consequences.
52. Genetics and the theory of evolution. Population genetics. Forms of natural selection: driving and stabilizing.
53. The basics of breeding
54. Genetic foundations of the selection of plants, animals and microorganisms.
55. Tasks of modern breeding. N.I. Vavilov's works on the origin of cultivated plants. The importance of the source material in breeding.
56. Plant breeding. Basic breeding methods: hybridization and artificial selection. The role of natural selection in breeding. Self-pollination and cross-pollinated plants. Heterosis. Polyploidy and postponed hybridization. Achievements in plant breeding.
57. Animal breeding. Crossing types and breeding methods. Method of analysis of hereditary economically valuable traits in animals. The postponed hybridization of domestic animals.
58. Selection of bacteria, fungi, its importance for microbiological industry (obtaining antibiotics, enzyme preparations, feed yeast, etc.). The main directions of biotechnology (microbiological industry, genetic and cell engineering).
59. Biosphere and scientific and technological progress
60. Biosphere in the period of scientific and technological progress and health of person. Environmental concerns: protection from pollution, conservation of the natural preserve areas, species diversity, biocenoses, landscapes.