

## **Программа вступительного испытания**

**По биологии, для приема иностранных граждан и лиц без гражданства на обучение с применением языка - посредника (английский язык)**

### **Syllabus of the entrance test in biology**

#### **Biology as a science.**

Biology is the science of wildlife. Methods of biology. Levels of organization of living things: molecular, cellular, organismic, population-specific, ecosystem, biosphere. Properties of the living: features of chemical composition, metabolism and energy, openness, growth, self-reproduction, heredity and variability, irritability, self-regulation; their manifestation in animals, plants, fungi and bacteria.

#### **Structure and functioning of the cell.**

A cell is a structural and functional unit of a living being. Cellular structure of organisms.

Chemical composition of cells. The content of chemical elements in the cell. Water, mineral salts and other inorganic substances, their role in life. Features of the structure and function of organic substances: proteins, carbohydrates, lipids, nucleic acids in connection with their functions.

The structure and functions of the cell organoids; the relationship of these components as the basis of its integrity. The diversity of cells. Prokaryotic and eukaryotic cells. Features of the structure of cells of plants, animals and fungi.

Plastic and energy exchange. Enzymes, their properties and role in metabolism. The main stages of plastic exchange. DNA replication. Genes. The genetic code and its properties. Transcription. Broadcast. The role of matrix processes in the implementation of hereditary information. Autotrophic and heterotrophic organisms. Stages of photosynthesis and the role of chlorophyll in this process. Biospheric significance of photosynthesis. Chemosynthesis. The main stages of energy exchange. Fermentation and cellular respiration, the metabolic role of oxygen. The role of ATP in energy and plastic metabolism. The relationship of energy and plastic metabolism.

Viruses are non-cellular forms. The role of viruses as pathogens of diseases, their prevention.

#### **Reproduction and individual development of organisms.**

Cell division is the basis for the growth, development and reproduction of organisms. Mitosis and meiosis are the main ways of eukaryotic cell division. Interphase. Stages of mitosis and meiosis. The significance of mitosis and meiosis.

Sexual and asexual reproduction, their role in nature. Methods of asexual reproduction in animals, plants and fungi.

Development of germ cells. Fertilization in animals and plants. Double fertilization is a feature of flowering plants. Alternation of sexual and asexual generations (gametophyte and sporophyte) in plants.

Ontogenesis is the individual development of an organism, the main stages of ontogenesis. Embryonic and postembryonic development. The main stages of embryo development (using the example of animals). Direct development and development with metamorphosis (indirect). The concept of the life cycle.

### **Fundamentals of genetics and breeding.**

Genetics is the science of heredity and variability of organisms. Basic methods of genetics. Mono-, di-crossing. Basic concepts of genetics: gene, allele, trait, homozygote and heterozygote, dominance and recessivity, genotype, phenotype and reaction rate. The laws of heredity established by G. Mendel, and the conditions for their implementation. Cytological foundations of the implementation of the laws of G. Mendel. Complete and incomplete domination. Chromosomal theory of heredity. Linked inheritance and its cytological foundations, violation of cohesion. Genetic sex determination, sex chromosomes and autosomes, inheritance of sex-linked traits.

Hereditary human diseases and their prevention measures. The effect of radioactive radiation and chemical mutagens (including nicotine, alcohol and narcotic substances) on human heredity.

### **The diversity of wildlife.**

The Kingdom of Bacteria.

The main features of the structure and vital activity of bacteria, their reproduction. Disputes. The role of bacteria in the biosphere. The importance of bacteria for agriculture, industry and medicine. Pathogenic bacteria and the fight against them.

The Kingdom of Mushrooms.

Fungi are parasites that cause diseases of plants, animals and humans. The role of fungi in the biosphere and its significance for humans.

The Animal Kingdom.

General characteristics of animals. Animals that cause human diseases (protozoa, worms).

### **Man and his health.**

*General overview of the human body:* basic tissues and organ systems. The importance of knowledge about the structure, vital activity of the body and human hygiene for the protection of his health.

*The system of covers.* The structure and functions of the skin. Skin derivatives: hair and nails. The role of the skin in thermoregulation, hardening of the body. Skin hygiene, prevention and first aid for burns, frostbite, and mechanical injuries.

*Musculoskeletal system and movement.* The main elements of the human musculoskeletal system. Parts of the skeleton: the axial skeleton, the skeleton of the limbs and their belts. The structure of bones and their functions. The main types of bones and their connections. Joints. Cartilage, tendons, ligaments. The structure of muscles and their functions. The main groups of human muscles. First aid for bruises, sprains, fractures and dislocations.

*Blood and circulation.* The concept of the internal environment of the organism, the meaning of the constancy of the internal environment. Blood, lymph and tissue fluid. Human blood composition: blood plasma and various shaped elements, their structure and functions. Immunity and its types. Antigens and antibodies. The role of I.I. Mechnikov in the creation of the doctrine of immunity. Infectious diseases and their control. Vaccinations and their role in the prevention of infectious diseases. Blood groups. Blood transfusion, donation. Blood clotting. The structure of the circulatory system: heart and blood vessels (arteries, capillaries, veins). Large and small circles of blood circulation. Prevention of cardiovascular diseases. First aid for bleeding. Harmful effects of smoking, alcohol and drug use on the cardiovascular system.

*Respiratory system and gas exchange.* The main components of the respiratory system. The structure of the lungs, the mechanism of inhalation and exhalation, gas exchange. The meaning of breathing. Respiratory hygiene. Respiratory diseases and their prevention. Prevention of the spread of infectious diseases. The purity of atmospheric air as a factor of health. First aid techniques for carbon monoxide poisoning and rescue of a drowning person.

*Digestive organs and nutrition.* The structure and functions of the digestive system. Departments of the digestive tract and their functions. Digestive glands. The role of enzymes in digestion. Regulation of digestion, research by I.P. Pavlov. Food products and nutrients: proteins, lipids, carbohydrates, minerals, water, vitamins. Hygiene of the digestive organs, rational nutrition. The importance of nutrition and digestion. Metabolism and energy in the human body, prevention of metabolic disorders. The role of vitamins in the body, their content in food products. Prevention of food poisoning, intestinal infections and parasitic diseases.

*Highlighting.* The structure of the human urinary system. Organs of the urinary system and their functions. Formation of primary and secondary urine. Prevention of diseases. The role of other organ systems in the release of metabolic products.

*Reproduction and development.* Male and female reproductive systems, their structure and function. Formation of germ cells. The main stages of individual human development. Causes of disorders of individual development; hereditary diseases, their causes and prevention. Sexually transmitted infections, their prevention.

*Nervous and humoral regulation of vital processes.* The main endocrine glands and their importance for the growth, development and regulation of body functions. Basic human hormones. The structure of the nervous system, its departments: the central and peripheral nervous system. The structure and functions of the brain and spinal cord. Somatic and autonomic nervous system. Sense organs, their structure and functions.

*Analyzers.* Malfunctions of analyzers and their prevention. Conditional and unconditional reflexes, reflex arcs. Higher nervous activity, speech and thinking. Consciousness as a function of the brain. Social and

biological conditionality of human behavior. The role of I.M. Sechenov and I.P. Pavlov in the creation of the doctrine of higher nervous activity. Disorders of the nervous system and their prevention. Sleep, its meaning and hygiene. The relationship between the processes of nervous and humoral regulation.