

CONFIRMED

At the admission committee meeting
Samarkand State Medical Institute,
Ministry of Health of Uzbekistan

**SYLLABUS
ON BIOLOGY
for applicants on the basis of secondary education**

Program for the entrance exams on Biology was created in accordance of biology course, which is provided the study curricula of secondary schools, the state standard basic and secondary education and "Program for independent external Evaluation of biology".

Knowledge of discipline "Biology" includes:

- formation of knowledge about the principles of operation and structure of biological systems, their ontogenesis and phylogeny, relationships between biological systems, the environment; mastering the methodology of scientific knowledge;
- developed skills to establish harmonious relationship with nature based on respect for life as the highest value and all life as a unique part of the biosphere;
- development of mental abilities and personality traits (cognitive interest, observation, imagination, attention, memory, theoretical thinking style), the desire for self-education, self-improvement, self-fulfillment in different activities;
- mastering the technology decision-making, free choice and action in the areas of life where overlapping problems of man as a living being, society and the environment;
- formation of a scientific outlook; forming emotional and value attitude to nature, to themselves, to people, to universal spiritual values.

LIST OF REQUIREMENTS

Biology - the science of nature

The value of biology in human life. The diversity of living organisms, their habitats, classification. The study of biological objects.

Part 1. Plants

The main functions of the plant organism. Characteristics of plants. Photosynthesis. Plant respiration. Water uptake and transport. Mineral requirements and uptake. Transport of organic substances. Conditions necessary for the life of the plant.

The structure of plants. Cells, tissues and organs of plants. Vegetative organs: root, shoot. Components of shoot: stem, leaf, bud. The main functions of plants.

Reproduction and development of plants. Unsexual reproduction. Sexual reproduction. The structure and variety of flowers. Cones. Pollination, fertilization. Seeds and fruit, their structure. The impact of environmental conditions on seed germination. Growth and development of plants. Plant movements. Photoperiodism.

Part 2. Fungi

Fungi and lichens. General characteristics of fungi. A variety of fungi. Distribution, habitat. Adaptive structural features and life. Lichen structure.

Part 3. Bacteria

Bacteria. General characteristics of bacteria. The values in nature and in human life.

Part 4. Organisms and habitats

Habitat and its factors. Resettlement of plants in nature. Ecological groups of plants. Life forms. The interaction of plants, fungi, bacteria and their role in ecosystems. Modern understanding of the historical development of bacteria, fungi, plants. Conservation.

Part 5. Animals

Zoology is the science that studies animals. Wildlife integral part of nature. A variety of animals and their classification. The role of animals in human life.

The structure and activity of animals. Organisation of animals. Features of the structure of animal cells. Tissues, organs and organ systems of animals, their function. The main manifestations of animal waste. Habitats of animals. Animal Behavior. The diversity of ways of life of animals. Links animals with other components of ecosystems.

Protists. General characteristics and diversity of the protists – the inhabitants of freshwater (Amoeba Proteus, Euglena green Paramecium caudatum), Sea (foraminifera and radiolarians) and soil. Parasitic protozoa (Entamoeba histolytica, malaria plasmodium etc.) The role of protozoa in ecosystems and their importance to humans.

Multicellular. The two tissue layer animal. General characteristics and diversity of multicellular animals. Sponges. Cnidarians. General characteristics.

Three-tissue layer animal. Worms. Flatworm. General characteristics, a variety of flat worms. Roundworms. General characteristics, variety. Ascaris and other roundworm infection. Annelids. General characteristics, variety. The role of worms in ecosystems. Value for humans.

Arthropods. General characteristics of the type of arthropods.

Class Crustacea. General characteristics. A variety of crustaceans. Role of crustaceans in ecosystems, their importance to humans.

Class Arachnida. General characteristics of the class. A variety of arachnids and role in ecosystems. The value of human life.

Insects Class. General characteristics of the class. Features of development. The behavior of insects. A variety of insects. The role of insects in ecosystems, their importance to humans. Privacy of arthropods.

Mollusks. General characteristics, a variety of mollusks. The role of molluscs in ecosystems, their importance to humans.

The vertebrates. Fishes. General characteristics of Cartilaginous and Bony Fishes. General characteristics of Amphibians, Reptiles, Birds and Mammals. The role of the vertebrates in ecosystems, their importance to humans.

Part 6. Organisms and habitats

Organisms and habitats. The impact of environmental factors on animals. The ethical relationship between man and other animals. The relationship of man with other species of animals.

Part 7. Human Biology

The value of the knowledge about of human to maintaining health. The origin of man. Features of the specie Homo sapiens.

The human body as a biological system. The concept of biological systems. Cellular structure of the human body. Characteristics of the tissue. Authorities. Physiological systems in human organs. The regulatory system of the human body.

Musculoskeletal system. Structure and function of the musculoskeletal system. Bone and cartilage tissue. The development of bone. Connections bones. The structure

of the human skeleton. Structure and function of skeletal muscles. Types of muscles. The mechanism of muscle contraction.

Blood and lymph. The internal body fluids person. Composition and functions of blood. Protective function of blood. Immunity. The specific and nonspecific immunity. Blood clotting.

Blood circulation and lymph circulation. Circulation organs: heart and blood vessels. Structure and function of the heart. Vascular system, its structure. The movement of blood through the vessels. Large and small circulation. Regulation of blood supply. Lymph and its value.

Breathing. The value of breathing. Structure and function of the respiratory system. Voice apparatus. Respiratory movements. Gas exchange in lungs and tissues. Neurohormonal regulation of breathing.

Nutrition and digestion. The energy needs of the body. The types of nutrients. Nutrition and health. Structure and function of the digestive system, digestive glands. Digestion in the small intestine. The functions of the large intestine. Regulation of digestion.

Thermoregulation. Support body temperature. Heat. Structure and function of the skin. The role of the skin in thermoregulation.

Excretory system. Structure and function of the urinary system. Human kidney. Regulation of water in the body.

Endocrine regulation functions of the human body. Principles of the endocrine system. Hormones. Hypothalamic-pituitary system. Endocrine glands.

Reproduction and development. The stages of human ontogenesis. Genetic sex determination. The development of germ cells. Fertilization. Embryonic development. The functions of the placenta. Postembryonic human development.

Nervous regulation of functions of the human body. The structure of the nervous system. Central and peripheral nervous system of man. Regulation of physical activity. Spinal cord. The brain. Brainstem. Cerebellum. Random movements and cerebral cortex. Regulation of the internal organs. The vegetative (autonomous) nervous system.

The sympathetic and parasympathetic nervous systems, their functions. The interaction of regulatory systems.

Sense organs. The structure analyzers. Chemoreceptors, photoreceptors, mechanoreceptors. Visual and auditory sensory system. Sensory systems of taste, smell, balance, motion, touch, temperature, pain.

Part 8. The biological basis of behavior and the human psyche.

Formation behavior and the human psyche. Reticular formation of the brain and the level of perception. Sleep. Biorhythms. The structure of instinctive behavior, its modification. Skills training. Memory. Types of memory. Acquired behavior.

Thinking and consciousness. Thinking and cerebral cortex of the brain. Functional brain asymmetry. Language. Individual features of human behavior. The nature of man. Consciousness.

Part 9. The molecular level of life

The elemental composition of organisms. Classification of chemical elements according to their content in the body (macronutrients, including organogenic elements, trace elements). The consequences of inadequate or excess intake of human chemical elements (I, F, Fe, Ca, K) and how to resolve their shortage. Endemic diseases.

Inorganic compounds in the body. The role of water, salts and other inorganic compounds in the body. Hydrophilic compounds. Hydrophobic compounds.

Organic compounds in organisms. Structure, properties and function of organic compounds. The concept of biopolymers and their monomers.

Carbohydrates: monosaccharides, oligosaccharides, polysaccharides. Features of the structure, basic features and functions in the bodies of living creatures.

Lipids, basic features and functions in living organisms.

Proteins: structure features. Amino acids, peptides and polypeptides. Levels of structural organization of proteins. The properties of proteins. Denaturation, renaturation, destruction of proteins. The functions of proteins in living creatures. Enzymes, their structure, properties and applications of human activities.

Nucleic acid. Structure, nucleotides. Structure, properties and function of DNA, the principle of complementarity. The concept of the gene. RNA and their types. ATP and its high-energy bonds.

Biologically active substances (vitamins, hormones, neurohormones, plant hormones, alkaloids, phytoncides, their biological role.

Part 10. The cellular level of life

Cell. The study of cells. Methods cytological studies. The structure of prokaryotic and eukaryotic cells. The cell membranes. The surface unit cell - a system of contact with the environment, its functions. The structure and functions of the nucleus. Nucleoid of prokaryotic cells.

Cytoplasm and its components. Cytosol, ribosomes. Protein synthesis. Cytoskeleton. Organelles: endoplasmic reticulum, Golgi apparatus, lysosomes, vacuoles, the mitochondria and the process of respiration and photosynthesis plastids.

The cell as a complete system. The cell cycle. Mitosis. Meiosis. Karyotype. Metabolism and energy in the cell. Modern cell theory. Cytotechnology.

Part 11. Organismal level of life

Non-cellular form of life. Viruses, prions. The structure, life cycles. Role in nature and human life.

Reproduction of organisms. Unsexual reproduction of organisms. Sexual reproduction of organisms. Structure and formation of sex cells.

Patterns of heredity. Basic concepts of genetics. Methods of genetic research. Laws H. Mendel their statistical nature and cytological basis. Chromosomal theory of heredity. Linked inheritance. Interaction between genes.

Patterns of variability. Types of mutations. Mutagens. Phenotypic variation.

Genotype as a complete system. Basic principles of functioning genes in pro- and eukaryotes. Human Genetics. Role of genotype and environment in shaping the phenotype. Differentiation of cells. The genetic basis of breeding organisms. The main directions of modern biotechnology.

Individual development of organisms. Fertilization. Periods ontogenesis of multicellular organisms: postembryonic embryogenesis and development. Effect of genotype and environmental factors on the development of the organism. Diagnosing defects person and their correction. Regeneration. The life cycle of plants and animals.

Part 12. Superorganismal levels of life organization

Population. Ecosystem. Characteristics populations. Gender and age structure of the population. Factors that influence population size, dynamics and fluctuations in population size.

The concept of habitat, ways adaptations of organisms to it. Biological rhythms adaptive organisms.

Communities and ecosystems. The composition and structure of communities. Interaction of organisms in ecosystems. The diversity of ecosystems. Development and changes in ecosystems.

Circulation of matter and energy flow in ecosystems. The productivity of ecosystems.

Biosphere. General characteristics of the biosphere. Biogeochemical cycles. The impact of human activities on the state of the biosphere. The ecological crisis of our time. Population growth and problems associated with it: lack of food, energy, fresh water, and environmental pollution. Possible ways to overcome the environmental crisis. Environmental management, alternative energy, conservation of biodiversity, protection of nature. International cooperation in the protection of nature.

Part 13. The historical development of the organic world.

Fundamentals of evolution. Lamarck's theory of evolution and Darwin. Biogenetic law of Haeckel-Müller. The main provisions of synthetic theory of evolution: the population as an elementary unit of evolution; elementary factors of evolution. Natural selection. Species, speciation. Microevolution. Adaptation as a result of the evolutionary process. The organic world as a reflection of its historical development. Hypotheses of life on Earth. Evolution of unicellular and multicellular organisms. Into

periods of evolutionary phenomena. The appearance of the major groups of organisms on Earth and forming ecosystems.

The main properties of living systems.

Opportunities and Prospects of applications of biology in ensuring the existence of mankind.

References:

1. Biology. – Sylvia S. Mader, Wm. C. Brown Publishers: Dubuque, Iowa – Melbourne, Australia – Oxford, England, IV edition. – 850 p.
2. Biology. Art notebook – Sylvia S.Mader, Wm. C. Brown Publishers: Dubuque, Iowa – Melbourne, Australia, 1995. – Oxford, England, IV edition. – 205 p.
3. Biology of the Invertebrates. – Yan A. Pechenik: Boston, Massachusetts, III-th edition. –557 p.
4. Introduction to Cell and Molecular Biology – Stephen L. Wolfe: Wadsworth Publishing Company, 1995 – 820 p.
5. Human Biology. – Jack Carey, 1995. – 527 p.