

The program of the biology examination

Theme 1.

General acquaintance with flowering plants. Flowering plant and its organs: root and sprout; sprout structure: stem, leaves, buds; flower is a modified sprout. The fruits and seeds, their adaptation to the spread in the nature. Composition of plants (organic and inorganic substances).

Theme 2.

The cellular structure of the plant. Magnifying devices (magnifying glass, microscope). The cell and its structure: the shell, cytoplasm, nucleus, plastids, vacuoles. The vital activity of the cell: the cytoplasm movement, flow of substances into the cell, its growth and division.

Theme 3.

Root. Types of roots. Types of root systems. The soil, its importance for the life of plants. Soil protection. External and internal structure of the root. Root zones. Root growth.

Main functions of the root: Absorption of water and mineral substances, strengthening of plants in the soil. Root respiration. Fertilizers. The value of tillage, fertilizer application. Root crops, their use by man.

Theme 4.

Sprout. Bud is a rudimentary sprout, its structure. The development of the sprout from the bud. Leaf. The external structure of the leaf. Venation. Simple and compound leaves. Leaves disposition. Specific features of the microscopic structure of the leaf in connection with its functions. Photosynthesis. Breathing. Leaf water evaporation. Modifications of leaves. Leaf fall. The need for air protection from pollution. Planting of greenery outdoors and indoors. Stem. The stem length increase. The formation of the crown. The internal structure of a woody stem in connection with its functions. The stem thickness increase. The formation of growth rings. Motion of mineral and organic substances in the plant. The deposition of storage materials. Modified sprouts: rhizome, tuber, bulb, their structure, biological and economic importance.

Theme 5.

Plant reproduction. Reproduction and its value. Reproduction methods. Vegetative reproduction. Vegetative reproduction and its role in the nature and crop

production. Seed reproduction of plants. Flower is a modified sprout. The value of the flower in the reproduction of plants. The structure of the perianth, stamens, pistle. The inflorescences and their biological significance. Cross-pollination by insects, wind. Self-pollination. Fertilization. Formation of seeds and fruits, their value in nature and human life. Damage done to the nature by the mass gathering of wild plants. Protection of flowering plants. The structure of seeds (for example, dicotyledonous and monocotyledonous plants), their chemical composition. Conditions of seed germination. Breathing of seeds. Nutrition and growth of seedlings. Agro technics for seed sowing and plant growing.

Theme 6.

Plants and environment. The plant is an integrated organism. Relationships of cells, tissues and organs. The basic processes of plant organism. Plant community. Ecological factors of animate and inanimate nature associated with human activities. The relationship of plants and factors of animate and inanimate nature with the example of forest and meadow plants and so on. The adaptation of plants to live together in the forest, meadow, etc. The role of plants in nature and human life. The impact of human activities on plant life in the forest, meadows. Protection of plants, protection of their habitat, the laws on nature protection.

Theme 7.

Plant types. Algae. The structure and vital activities of unicellular and multicellular algae. Reproduction of algae. The filamentous algae. Algae. The role of algae in nature and the national economy, their protection. Mosses. Structure and reproduction (for example, native species). peat formation, its significance. Environment-forming and resource significance of moss in the swamp community. Ferns. Structure and reproduction role in nature and human life. Horsetails. Club mosses. Gymnosperms. Structure and reproduction (on the example of pine, fir or other conifers). The distribution of coniferous, their value in nature, national economy. Regulation of the number of conifers. Reforestation of coniferous forests. Angiosperms (flowering plants). Specific features in the structure and functioning of angiosperms as the most highly organized group of plants, their dominance in the world. Variety of flowering plants. Class of dicotyledonous plants. Families: cruciferous (cabbage), rosaceous, legumes, solanaceae, compositae (asteraceae), malvaceae, goosefoots, grapes (depending on local conditions). Class of monocotyledonous plants. Families: liliaceae, gramineae, bluegrasses. Distinguishing features of the listed plant families, their biological characteristics, national economic significance. The influence of human activities

on the species diversity of flowering plants. Conservation and restoration of rare species of flowering plants.

Theme 8.

Agricultural crops. The most important agricultural crops (cereals, fruit and berries, vegetables, oil crops, technical and others), the biological basis and of technology of their cultivation. Scientific achievements in the development of new crop varieties.

Theme 9.

Development of the plant world. Diversity of plants and their origin. Evidence of the historical development of plants. The main stages in the development of the plant world: the emergence of unicellular and multicellular algae; the emergence of photosynthesis; plants access to land (psilophytes, mosses, ferns, gymnosperms, angiosperms). The increasing complexity of the plants in the process of historical development. Phylogenetic relationships in the plant world. The dominance of angiosperms now, their diversity and distribution in the world. The impact of human activities on flora. The conservation of biological diversity of plants.

Theme 10.

Bacteria. The structure and vital activity of bacteria, their reproduction. Their spread in the air, soil, water, living organisms. Their role in nature, industry, medicine and agriculture. Pathogenic bacteria and their control.

Theme 11.

Mushrooms. Lichens. General characteristics of fungi. Pileate mushrooms, their structure, nutrition. The symbiosis of fungi with plants. Edible and poisonous mushrooms. Terms of mushroom collection and their protection. Prevention of mushroom poisoning. Mold fungi. Penicillium, its use for the synthesis of antibiotics. Yeast. Mushrooms parasites that cause plant diseases. The role of fungi in nature and economy. The structure of the lichen. The symbiosis of fungi and algae. Nutrition. Reproduction. The role of lichens in nature.

Theme 12.

General information about the animal world. The diversity of wildlife. The main differences between the animals and plants, features of their similarities. Systematics of animals.

Theme 13.

The unicellular as the most primitive and ancient animals. An ordinary amoeba. The structural features of cells of a single-celled organism. Habitat. Locomotion. Nutrition. Breathing. Excretion. Reproduction. Cyst formation. The diversity of single-celled animals: the green euglena, the features of its structure and nutrition, ciliate-shoe, malarial parasite, marine protozoa. Irritability. Significance of single-celled animals in nature, human life. General characteristics.

Theme 14.

The type of multicellular animals. The freshwater hydra. Habitat. External and internal structure. Radial symmetry. Bilayer. The structure of the cells of a multicellular animal. Specialization of cells. Types of cells and their functions, processes of life. Nervous system. Reflex. Regeneration. Reproduction. The diversity coelenterates (coral polyps and jellyfish), their significance. General characteristics of the type. The type of Flat worms, their diversity. The white planaria is a free-living flatworm. Bilateral symmetry. Features of the structure and vital processes of the liver fluke worms and other parasites, control measures. General characteristics of the type. The type of roundworms. The human ascaris and pinworm are human parasites. Preventive measures against ascariasis infection. The type of Annelid worms, their diversity. Earthworm, its habitat, the external structure, locomotion. Tissues, organs, organ systems. The processes of life. Regeneration. Reproduction. The role of earthworms in soil formation. General characteristics of the type. Type of mollusks. Edentate. Habitat, particular features of the external structure, nutrition, respiratory, reproduction. The diversity mollusks (great pond snail, grape snail, slugs, oysters, mussels), their significance in nature, human life. General characteristics of the type.

Theme 15.

Type of arthropods. The class of crustaceans. The habitat of crustaceans. Specific features of the structure, life activity; reproduction, variety of crustaceans. General characteristics of the class. The class of arachnids. Specific features of the external structure, nutrition, breathing, behavior of the spider in relation to the life on the land. General characteristics of the class. Mites. The external structure. Mites are the pests of cultivated plants and their control measures. Parasitic mites are pathogens and carriers of dangerous diseases. Measures of protection against mites. General characteristics of the class. The class of insects. Specific features of the structure, insect life processes with the example of the beetle. Reproduction. Types of insect development. The main insect groups. Lepidopterans. Features of adaptation to the environment in then external structure; reproduction and development of butterflies. Silkworm. Sericulture. Dipterans. Housefly is a

pathogen carrier of dangerous diseases of man and control measures. Hymenopterans. Honeybee. The composition and the life of the bee colony: bee dancing, wintering. Instincts are the basis of the behavior of insects. Beekeeping. General characteristics of the class. The diversity of insects (Colorado potato beetle, ants, riders), their role in nature; practical and aesthetic significance. The biological method of controlling insects, pests of agricultural crops and its role in preserving the harvest. Protection of insects. General characteristics of the type.

Theme 16.

The type of chordates. Lancelet. Habitat. Features of the structure of lancelet as the lower chord. General characteristics of the type. The class of Pisces. The habitat of fish. Features of the external structure, of the skeleton and muscles. The cavity of the body. The structural features of the systems of internal organs in connection with their functions. Metabolism. Nervous system and sense organs. Reflexes. Behavior. Reproduction, spawning and development. Caring for offspring. Adaptability of fish to habitat. Migration. The diversity of fish (units: clupeiformes, crossopterygian et al.). The economic value of the fish. Artificial breeding of fish, pondculture. Protection of fish. General characteristics of the class. The class of Amphibians. Frog. The specific features of the structure and locomotion in connection with the environment. The nervous system and sensory organs. Reproduction and development. The diversity of amphibians (groups: tailed, tailless), their origin, significance and protection. General characteristics of the class. The class of Reptiles. Lizard. The habitat, features of the structure, reproduction and behavior in relation to life on land. Regeneration. The diversity of modern reptiles (units: scaly, turtles, crocodiles), their practical value and protection. The origin of reptiles. Ancient reptiles: dinosaurs, mammal-like lizards. General characteristics of the class. The class of Birds. The external structure, the skeleton, the musculature. Features of the internal structure, and metabolism of birds related to the flight. The increasing complexity of the nervous system, sensory organs; the behaviour of birds. The origin of birds. Reproduction and development. Caring for offspring. The adaptation of birds to seasonal phenomena of nature (nesting, dispersal, flights). Birds of parks, meadows, fields, forests, swamps, coasts, rivers, steppes, deserts, predatory birds. The role of birds in nature and human life, the system of measures for the protection of birds. General characteristics of the class. Poultry-keeping. The origin of domestic fowls, their breeds. The class of Mammals. Features of the external structure, skeleton, muscles, internal structure, and metabolism of a mammal. The increasing complexity of the nervous system, sense organs, behavior. Reproduction and development, care of the offspring. The origin of mammals. The first animals.

Marsupials. The groups of the placental. Insectivores and cheiroptera. Rodents. Lagomorphs. Carnivorous. Pinnipeds and cetaceans. Hoof. Primates. The role of mammalian in nature and human life. Preservation of species diversity by adjusting their size, ecosystem protection as a habitat for mammals. Farm animals of the mammal class. Cattle, sheep, pigs, horses. Origin of animals. Housing, feeding and breeding. General characteristics of the class. The evolution of the animal world. Evidence of the historical development of the animal world: comparative anatomy, embryology, paleontology. Charles Darwin on the causes of the evolution of the animal world. The origin of single-celled. The origin of multicellular organisms. The increasing complexity of the structure and functioning of vertebrate animals in the process of historical development of the animal world. Kinship of man and animals.

Theme 17.

Natural communities. Habitat of organisms. The main environmental factors of the environment and their effects on plants and animals. Natural community (for example, forests, meadows, ponds). The role of plants, animals, fungi and bacteria in the natural community. The relationships in the natural community. Food chains. The significance of natural communities in human life. The impact of human activities on the natural communities, their protection.

Theme 18.

Man and his health. An overview of the human body. The value of knowledge about the structure, the life activity of the human body and health protection hygiene. The man and the environment. The structure of the cell (cytoplasm, nucleus, ribosomes, mitochondria, membrane). Basic cell processes of life (food, breathing, division). Brief information about the structure and functions of the basic tissues. Reflexes. Nervous and humoral regulation of the activity of the organism. The body is a single entity.

The organs and organ systems. Musculoskeletal system. The significance of the musculoskeletal system. Human skeleton, skeleton similarity of humans and animals. Specific features of the human skeleton, related to work and bipedal locomotion. The types of bone connections. The composition, structure and properties of bones, bone growth. The first aid for bruises, sprains, dislocations, fractures. Muscles and their functions. The main groups of muscles of the human body. Work of muscles. Static and dynamic load. Impact of rhythm and load on the work of muscles.

Blood and blood circulation. The internal environment of an organism (blood, intercellular fluid, lymph) and its relative permanence. The significance of the blood and blood circulation. The composition of the blood. Blood plasma. Blood coagulation as a protective reaction of the organism. Structure and function of red blood cells and white blood cells. Immunity.

The role of I.I. Mechnikov in the creation of the doctrine of immunity. Infectious diseases and their control. Preventive vaccination. Prevention of HIV and AIDS. Blood groups. Blood transfusion. Donation. Blood circulatory organs: heart and blood vessels (arteries, capillaries, veins). Heart, its structure and operation. Large and small circles of blood circulation, lymph circulation. The flow of blood through the vessels. Blood pressure. Nervous and humoral regulation of the activity of the heart and blood vessels. The prevention of cardiovascular diseases.

The first aid for bleeding. The harmful effects of smoking and alcohol consumption on the heart and blood vessels. Breathing. The value of breathing. The structure and functions of the respiratory system. The vocal apparatus. Gas exchange in the lungs and tissues. Respiratory motion. Vital capacity of the lungs. Nervous and humoral regulation of breathing. Artificial respiration. Infectious diseases transmitted through the air, prevention of airborne infections, hygienic regimen during the illness. Hygiene of the respiratory organs. The harmful effects of smoking on the respiratory system. Environmental protection of the air.

Tema 19. Theme 19.

Digestion. The importance of digestion. Nutrients and foods. The structure and functions of the digestive system organs. The teeth, prevention of dental diseases. Digestive enzymes and their importance. The role of I. P. Pavlov in the study of the functions of the digestive system organs. The liver and pancreas, their role in digestion. Suction. Regulation of digestive processes. Hygienic conditions of normal digestion. Prevention of helminthic and gastrointestinal diseases, food poisoning, the first aid with them. The effect of smoking and alcohol consumption on digestion.

Theme 20.

Metabolism and energy exchange. Excretion. General characteristics of the metabolism and energy exchange. Plastic metabolism, energy exchange and their relationship. The value of protein, fats and carbohydrates, water and mineral salts for the human organism. The effects of alcohol and toxic substances. Vitamins. Their role in metabolism. Main hypovitaminosis. Hypervitaminosis. Methods of vitamin preserving in food products. Food standards. Balanced diet. The diet of

schoolchildren. The organs of the urinary system, their function, prevention of diseases.

Theme 21.

Skin. The structure and functions of the skin. The role of skin in thermoregulation. Strengthening of the organism. Skin hygiene, hygiene requirements for clothing and footwear. Prevention and the first aid for heat and sunstroke, burns and frostbites, electroshock.

Theme 22.

Glands of internal secretion. The value of the endocrine glands to growth, development and regulation of body functions. Hormones. Role of the sex glands in the development of the organism. Puberty. Hygiene for boys and girls.

Theme 23.

Nervous system. Sense organs. The higher nervous activity. The significance of the nervous system in the regulation and coordination of the human body functions and relationship with the environment. Central and peripheral nervous system. The structure and functions of the spinal cord and the brain.

The role of the autonomic nervous system in the regulation of the internal organs. The bark of the big hemispheres. The senses, their meaning. Analyzers. Structure, functions, hygiene. Unconditional and conditional reflexes. The biological importance of formation and inhibition of conditioned reflexes. Features of higher nervous activity of man. Speech and thinking. Consciousness as a function of the brain. Social conditionality of human behavior. The role of I.M. Sechenov and I.P. Pavlov in the establishment of the doctrine of higher nervous activity. Sleep, its value and hygiene. The change of efficiency in the labour process. Daily regime for schoolchildren. The harmful effect of nicotine, alcohol and drugs on the nervous system. The system of reproductive organs. Impregnation and intrauterine development. Birth of a child. The growth and development of the child. Health of infants. The harmful effects of alcohol, nicotine, and other factors in the offspring.

Theme 24.

General biology. The significance of biological science for agriculture, industry, medicine, hygiene, environmental protection. General biological laws. Levels of organization of living nature: cellular, organism, species, biocenotic, biospheric. Basics of cytology. The main provisions of the cell theory. The cell is a structural and functional unit of living organisms. The structure and functions of the nucleus,

membrane, cytoplasm and its main organoids. Specific features of cell structure of prokaryotes, eukaryotes, autotrophs and heterotrophs. The content of the chemical elements in the cell. Water and other inorganic substances, their role in the cell life. Organic substances: carbohydrates, lipids, proteins, nucleic acids, ATP, their role in the cell. Enzymes and their role in the regulation of life processes. Self-doubling of DNA. Metabolism and transformation of energy are the basis of cell life activity. Energy metabolism in the cell and its essence. The value of ATP in energy metabolism. Plastic exchange. Photosynthesis. Biosynthesis of proteins. Gene and its role in the biosynthesis. DNA code. Matrix synthesis reactions. Viruses, particularity of their structure and functioning, HIV infection and AIDS.

Theme 25.

Reproduction and individual development of organisms. Cell division is the basis of reproduction and individual development of organisms. Preparation of cells to division. Chromosomes, their haploid and diploid sets, and the constancy of number and form. The division of the cells and its significance. Sexual and asexual reproduction of organisms. Reproductive cells. Meiosis. The development of ova and spermatozoa. Fertilization. The development of the embryo (for example, in animals). Post-embryonic development. The harmful effects of alcohol and nicotine on the development of the human body.

Theme 26.

Basics of genetics. Genetics is the science of heredity and variation of organisms. Basic methods of genetics. The mono- and two-hybrid crossing. Analysis of the offspring. The laws of heredity established by G.Mendel. Dominant and recessive traits. Allelic genes. The phenotype and genotype.

Homozygote and heterozygote. The uniformity of the first generation. Intermediate character of inheritance. Law of splitting of characteristics. The statistical nature of splitting. Cytological bases of uniformity of the first generation and splitting of characteristics in the second generation. The law of independent inheritance and cytological bases. Linked inheritance. Debonding. Crossing of chromosomes. Genotype as a complete historically established system.

Genetics of sex. The chromosomal theory of heredity. The significance of genetics to medicine and health. The harmful effect of nicotine, alcohol and drugs on human heredity. The role of genotype and environmental conditions in the formation of the phenotype. Modification variability. The norm of reaction. Statistical patterns of modification variability. Mutations and their causes. The law of homologous series in hereditary variation, formulated by N.I. Vavilov.

Experimental synthesis of mutations. Mutations as a material for artificial and natural selection. Environmental pollution by mutagens and its consequences. Genetics and evolution theory. Genetics of populations. The forms of natural selection: the driving and stabilizing.

Theme 27.

Basics of selection. N.I. Vavilov about the origin of cultivated plants. The main methods of selection: hybridization and artificial selection. The role of natural selection in selection. The selection of plants. Self-pollination of the cross-pollinated plants. Heterosis. Polyploidy and distant hybridization. Breeding of animals. Types of crossing and breeding methods. Method of analysis of hereditary economically valuable traits in animal producers. Distant cross-breeding of pets. Biotechnology and its main trends: microbiological synthesis, gene and cell engineering. The value of biotechnology for selection.

Theme 28.

Evolutionary theory. Pre-Darwin ideas of the evolution of nature. The main provisions of the theory of evolution of Charles Darwin. The significance of the theory of evolution for the development of natural science. Species. Species criteria. Population is a unit of the species and evolution. The driving forces of evolution. The leading role of natural selection in evolution. The emergence of devices. The relative nature of adaptation. Artificial selection and genetic variation are the basis of breeding domestic animals and creating varieties of cultivated plants. Microevolution. Speciation. Modern conceptions. The results of evolution: adaptation of organisms, species diversity. The main directions of evolution: anamorphosis, idioadaptation. Biological progress and regress. The ratios of different directions of evolution. Basic laws of evolution. The results of evolution. The emergence and development of life on Earth. A brief history of the development of the organic world. The origin and development of man. The most ancient, ancient, modern people. Charles Darwin on the origin of man. Social and biological factors of anthropogenesis. The leading role of the laws of social life in the social progress of mankind. The human races, their origin and unity.

Theme 29.

Basics of ecology. The subject and objectives of ecology. Ecological factors: abiotic, biotic, anthropogenic, their complex effect on the organism. Photoperiodism. Life environments. The ecological niche. Species, its ecological characteristics. Population, the change in its size, the number of ways of its regulation. Rational use of species, the preservation of their diversity.

Biogeocoenosis. Development of populations in biogeocoenose and their interrelationships. Food chains.

Theme 30.

The fundamentals of the doctrine about biosphere. Biosphere. V. I. Vernadsky about the origin of the biosphere. The boundaries of the biosphere. The biomass of the land surface, oceans, soil. Living matter and its functions. The circulation of substances and energy transformation in the biosphere.