

Content of the questions on Biology

BIOLOGY (the last two years of high school)

1. Unity and Diversity of Life

Biodiversity. Concept of species. Classification systems. Basic characteristics of the five kingdoms.

Levels of organization of living things.

Cell theory. The cell: unit of structure and function.

Models of cellular organization: prokaryotes and eukaryotes.

Microscopic observation of single-celled organisms and animal tissues.

2. Human Tissues, Organs, Apparatus and Systems

Tissues: epithelial, muscle, nerve, connective.

Organs.

Systems: integumentary, nervous, circulatory, endocrine, muscle, skeletal, lymphatic. Vital functions: nutrition, sensory, reproductive.

Function of nutrition. Stages of the nutrition process. Nutrients. Balanced diet.

Classification of foods. Vitamins.

Response to external stimuli. Sensory receptors. Nerve impulse. Synapsis. Central and peripheral nervous system. Hormone coordination. Principal hormones.

Reproductive function. Female and male reproductive apparatus. The formation of gametes. Fertilization and embryo development. Menstrual cycle.

3. Molecular and Physical-Chemical Basis of Life.

Chemical composition of living things.

Bioelements: principal, secondary, dietary elements.

Organic biomolecules: carbohydrates, lipids, proteins and nucleic acids.

Inorganic biomolecules: water and mineral salts.

Chemical bonds and their importance in biology.

Biocatalysts. Enzymes.

4. Cell Morphology, Structure and Functions.

Cell morphology. Structure and function of the cell envelope, nucleus and organelles.

The membranes and their function in cellular exchanges. Transport of molecules across the membrane. Selective permeability. The processes of endocytosis and exocytosis.

The cell cycle. Phases. Cell division. Mitosis and meiosis.

Metabolic processes: anabolism and catabolism. Energy and ATP.

Cell respiration: its biological significance. Aerobic and anaerobic pathways. The mitochondria: structure, composition, functions.
Catabolism of carbohydrates, lipids and proteins.
Chemosynthesis.
Cellular study methods.

5. Inheritance. Molecular Genetics.

Human genetics: gene, chromosome, inheritance, genotype, phenotype, karyotype.
Mendel's laws.
Chromosome theory of inheritance.
Sex inheritance. Sex-linked inheritance. Sex-influenced inheritance.
Molecular genetics or the chemistry of inheritance. Identification of DNA as the carrier of genetic information. Structure and function of DNA.
RNA: structure, types and function.
Mechanism of replication, transcription and translation.
Characteristics and importance of the genetic code and experimental evidence they are based on.
Genomics and proteomics. Genetically modified organisms.
Alterations to genetic information: mutations. Mutagenic agents. Mutations and cancer. Genetic diseases. Implications of mutations in evolution and the appearance of new species.

6. The World of Microorganisms and Their Applications.

Study of microorganism diversity. Their forms of life. Bacteria and viruses: classification, structure, life cycle.
Interactions with other living things. Role of microorganisms in biogeochemical cycles.
Pathogenic microorganisms and infectious diseases. Asepsis and antisepsis.
Introduction to methods for studying and growing microorganisms.
Use of microorganisms in industrial processes. Social and economic importance.

7. Immunity and Its Applications.

Concept of immunology, the immune system and immunity. Types of immune response. The body's defenses. Inflammatory response. Immune reactions: cellular and humeral.
Concept of the antigen. Concept of the antibody: structure and functions. Antigen-antibody reaction.
Mechanism of action of the immune response. Immunological memory.
Natural and artificial or acquired immunity. Serums and vaccines.
Dysfunctions of the immune system: allergies and immunodeficiencies, acquired immunodeficiency syndrome (AIDS) and its effects on the immune system, other diseases of the immune system.
Monoclonal antibodies and genetic engineering.
Organ transplants and the problem of rejection.

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