
Medical biology

1. Structure and functions of proteins. Primary, secondary, tertiary and quaternary structures. Allostery.
2. Structure and functions of polysaccharides, chemically modified carbohydrates, glycoproteins and proteoglycans.
3. Structure and functions of glycerolipids (triglycerides and phosphoglycerolipids).
4. Structure and functions of nucleic acids (DNA and different types of RNA). Chromosomes, genes, alleles, the genetic code.
5. Vitamins. Classification and biologically active derivatives.
6. Reversible inhibition of enzyme activity. Physiological regulation of enzyme activity (allosteric regulation and covalent modifications).
7. Mechanism of semiconservative DNA replication. DNA polymerases. DNA repair mechanisms.
8. Transcription. The promoter and the initiation of transcription. RNA polymerases. Regulation of transcription.
9. Processing of eukaryotic mRNA. place and mechanism of translation.
10. Glucose oxidation. Aerobic and anaerobic energy metabolism.
11. Citrate cycle and the oxidative phosphorylation.
12. The origin of life. Chemical evolution, the RNA world. Characteristics of prokaryotic cells. Bacterial diseases.
13. Compartmentation of eukaryotic cells. Functions of some major cell organelles (nucleus, nucleolus, mitochondria)
14. Compartmentation of eukaryotic cells. Functions of some major cell organelles (endoplasmic reticulum, Golgi, lysosomes)
15. The Mendelian laws of inheritance. Sex-linked inheritance. Inheritance of mitochondrial genes.
16. Control of mitotic cell division, checkpoints in the cell cycle. The role of growth factors.
17. Cellular responses to signals. Cell surface and cytoplasmic/nuclear receptors. G proteins, second messengers, protein kinase cascades.
18. Endocrine, paracrine and autocrine effects. Hormones, neurohormones and their actions. Examples (hypothalamus, pituitary gland, adrenal gland, etc.).
19. Structure and function of the mammalian heart. The cardiac cycle. Generation and conduction of action potentials.
20. Structure and function of the human respiratory system. Gas exchange in the alveoli. Transport of oxygen and carbon dioxide in the blood.

21. Structure and function of the human digestive system. The major enzymes of carbohydrate, protein and lipid digestion. Absorption of nutrients.
22. Structure and function of the human kidney. The nephron. Filtration and reabsorption.
23. Mechanism of muscle contraction, the role of calcium ion. The structure of skeletal (striated), cardiac and smooth muscle tissues.
24. The nervous tissue. Nerve cells and glial cells. Generation and conduction of neuronal signals. Resting and action potential.
25. The human reproductive system. Male and female sexual organs and sexual hormones. The biological role of meiosis.
26. Cellular and humoral immune responses. T and B cells, plasma cells. Major histocompatibility complex. Immunoglobulins. Active and passive immunizations.
27. General design of viruses. Multiplication of bacteriophages and animal viruses. RNA replication and reverse transcription.