

State exam questions from Biochemistry

1. Nucleic acids structure of nucleosides and nucleotides, the structure of nucleic acids – DNA and RNA, Central dogma – information transfer in living organisms, replication, transcription, translation mutation and chemical modification of nucleotides and its effect on protein structure
2. Amino acids – their structure, nomenclature, chemical properties, the role of side chains for the structure of proteins, metabolism of amino acids, glucogenic and ketogenic amino acids, pathways of sugar generation from amino acids
3. Proteins – the peptide bond and its physical and chemical properties, peptides in living organisms, primary, secondary, tertiary, and quaternary structure of proteins, globular and fibrillar proteins and their structure and function, post-translation modification of proteins
4. Sugars – their structure, chemical properties, cyclisation, glycosidic bond, monosaccharides, oligosaccharides; polysaccharides, their function, and examples such as glycogen, starch, and cellulose; glycoconjugates, glycoproteins, peptidoglycans
5. Lipids – definition of a lipid, examples of lipids including lipids other than fatty acids; fatty acids and their structure, storage role of lipids, triacylglycerols, structural role of lipids, membrane lipids
6. Lipids – the structure of biological membranes, role of individual components of membrane, structure of membrane lipids and its role in membrane function, membrane fluidity, membrane transport, signalization, membrane rafts
7. Enzymes – biochemical principles of enzymes function, enzymatic catalysis, proenzymes, the active site of an enzyme, nomenclature of enzymes, coenzyme, prosthetic group, regulation, and inhibition of enzymatic activity
8. Metabolism – the spontaneity of biochemical reactions, thermodynamics – free energy and entropy, principles of metabolism – anabolism and catabolism, role of redox reactions in metabolism, principal electron carriers, ATP, substrate phosphorylation
9. Metabolism of sugars – glycolysis and its principal function in the organism, a summary of glycolytic reactions, two phases of glycolysis, the energy yield of glycolysis, localization glycolytic reactions in the cell, gluconeogenesis – bypass reactions
10. Metabolism of sugars – anaerobic reactions of pyruvate, oxidation of pyruvate, connection of glycolysis, citric acid cycle and oxidative phosphorylation, pentose phosphate pathways
11. Metabolism of lipids – β -oxidation of fatty acids, its principles and reactions, further fate of β -oxidation products in the organism, connection to the respiratory chain, differences in the energy metabolism of lipids and sugars, the role of lipids and sugars in energy metabolism
12. Citric acid cycle TCA – the role of TCA in catabolic reactions, localization of TCA in the cell and organelles, TCA reactions and its energy yield, the anabolic role of TCA, anaplerotic reactions

13. Electron transport and oxidative phosphorylation – role and primary function of electron transfer in energy metabolism, localization of these reactions in the cell and organelles, individual complexes of the respiratory chain, sources of electrons in the respiratory chain
14. Electron transport and oxidative phosphorylation – the connection between electron transport and oxidative phosphorylation, structure of ATP, principles of energy accumulation in a molecule of ATP, the structure of ATP synthase and its function
15. Photosynthesis – localization in the cell and organelle, overall reaction of photosynthesis, types of pigments in photosynthesis and their spectral properties, the reaction of the light phase of photosynthesis, principles of ATP formation in photosynthesis, terminal electron acceptor in photosynthesis, dark phase of photosynthesis, the principle of Calvin cycle and its three phases, enzyme RuBisCO