BSc. Biological Chemistry study programme
State exam including Biomedicine
Including Clinical Biochemistry, Introduction into Biomedicine, and Biopharmacy questions
(as compiled/collated on 15. 5. 2025 – JCh and JŠ)

Students are randomly picking ONE question from Part 1 (ca 15 min)
and ONE question from Part 2 (ca 15 min).

Part 1 – Biomedicine

1. Skeletal system – functions, structure and composition of the skeletal system, structure and composition of bone, ossification and its regulation, bone remodeling, types of bones and cartilage, bone connections, structure and function of joints, tendons, and ligaments
2. Muscular system – mechanism of muscle contraction, structure and organization of striated muscle, structure and composition of muscle fiber, neuromuscular junction, muscle innervation; structure and function of smooth and cardiac muscle
3. Respiratory system – division and function of the respiratory system, structure and function of alveoli, pneumocytes, gas exchange
4. Digestive system – organs, functions, structure of the gastrointestinal tract (GIT), digestion, liver, pancreas, regulation of digestion
5. Cardiovascular system – pulmonary and systemic circulation, arteries, veins, microcirculation, lymphatic circulation, blood, lymph
6. Nervous system – functions of the central and peripheral nervous systems, structure of a nerve, structure of a neuron, impulse conduction, synapse, reflex arc, anatomical structure, location and function of the sympathetic and parasympathetic systems, cranial nerves, glial cells, neurotransmitters
7. Endocrine system – endocrine organs/glands, their functions, description and function of endocrine axes, types of hormones, homeostatic regulatory mechanisms, feedback
8. Excretory system – structure and function of the organs, nephron, filtration, reabsorption and secretion, regulation of excretion
9. Reproductive system – male and female reproductive organs, spermiogenesis, oogenesis, hormonal regulation of gamete development, follicular maturation and menstrual cycle

Part 2 – Clinical Biochemistry, Biopharmacy

10. Water in the human body – content in the human body and its compartments, regulation of water content and minerals concentration, and the effect of incorrect water content on our health. Oncotic and osmotic pressure. pH in bodily fluids.
11. Types of bodily samples in clinical biochemistry and the differences between them – preparation, for what purpose are they used? What is STATIM and critical/panis values?
12. Amino acids – what are essential and semi-essential amino acids; proteinogenic amino acids; metabolism/catabolism of amino acids. Disorders of amino acid metabolism.
13. Biological functions of amino acids and peptides in the human body. Examples of peptide hormones.

14. Glucose metabolism – concentration in blood, regulation of concentration, diseases.
15. Pre-analytical, analytical, and post-analytical sources of error in diagnostics and ways to minimise them, precision, accuracy, specificity, sensitivity. What is CE IVD, and why is it important?
16. Composition of blood and the usual concentrations. Examples of molecules that affect urine composition in the case of high blood concentration.
17. Acute phase proteins – what are they and what is their role in diagnostics?
18. Diabetes mellitus – what is it, what are the symptoms and causes? Diagnostics.
19. Antibodies – structure, role in the organism, classes, and their use in diagnostics.
20. Hormones and receptors – effects on the human body of ACE inhibitors, somatostatin, calcitonin, oxytocin.
21. POCT tests – examples, principles, role in diagnostics.
22. Lipids – types, the role in the organism in general. Specific lipids – cardiolipin, sphingomyelin, cerebrosides, and gangliosides.
23. Fatty acids, cholesterol – sources, importance for the human body, various roles. Essential and conditionally essential fatty acids.
24. Digestion and metabolism of lipids – main steps (from ingestion to the GIT to utilisation in cells).
25. Lipoproteins (lipid particles in the blood) – role in the organism, their determination and importance in diagnostics.
26. Dyslipidaemia – reasons and main approaches to treatment.
27. Enzymes of diagnostic value – examples, description of their use in diagnostics (markers of diseases), methods of detection.
28. Protein markers of myocardial infarction.
29. Markers of hepatic injury or diseases.
30. Cerebrospinal fluid and urinein diagnostics – specifities compared to blood samples.