

Questions for oral exam in biochemistry

General Medicine

1. Enzymes – general characteristics, structure and function
2. Naming and classification of enzymes
3. Catalysis of biochemical reactions, mechanism of enzyme action and specificity of enzymes
4. Constitution and induction enzymes (e.g. repression of enzymes, regulation of enzymatic activities)
5. Kinetics of enzymatic reactions, Michaelis-Menten constant K_m , inhibition of enzymatic reactions
6. Allosteric enzymes (e.g. effectors, significance in metabolism)
7. Isoenzymes, multienzyme complexes - examples, biologic roles
8. Coenzymes of oxydoreductases - examples, mechanism
9. Coenzymes of transferases - examples, mechanism
10. Coenzymes of lyases, ligases, and isomerases - examples, mechanism
11. Coenzymes of carboxylation and decarboxylation reactions - examples, mechanism
12. Coenzymes that carry single carbon units - examples, mechanism
13. Activity of enzymes and its determination (e.g. units, diagnostics importance)
14. General regulation mechanisms of catalytic activity in living systems
15. Modulation of enzymatic activity (e.g. activation, inhibition, mechanisms)
16. The cell and their intermediary metabolisms
17. Endergonic and exergonic reactions in metabolism - examples, importance
18. Macroergic compounds and their role in metabolism
19. Biological oxidation (e.g. oxidases, oxygenases, peroxidases)
20. Formation and toxicity of oxygen radicals (ROS)
21. Enzyme antioxidants and low molecular antioxidant systems, role in living systems
22. Respiratory chain and its enzymes
23. Aerobic phosphorylation - principles, mechanisms
24. ATP-ase - structure, inhibitors of aerobic phosphorylation, decoupling
25. Phosphorylation at a substrate level - examples
26. Citric acid cycle – reaction, basic function
27. Enzymes of the citric acid cycle – general and specific properties
28. Regulation of the citric acid cycle reactions. Role of ATP, ADP and AMP
29. Energetic balance of reactions of the citric acid cycle
30. Anaplerotic reactions of citric acid cycle (biochemical importance)
31. Significance of acetyl-CoA in the intermediary metabolism
32. Conversions of glucose-6-phosphate – its role in the intermediary metabolism
33. Glycolysis, regulation and its energetic balance
34. Gluconeogenesis (e.g. regulation, importance)
35. Metabolic pathway of pyruvic acid (e.g. oxidative decarboxylation of pyruvate)
36. Cori cycle and glucose-alanine cycle (e.g. role, importance)
37. Pentose phosphate cycle – biological and biochemical role
38. Synthesis and degradation of glucuronic acid
39. Metabolism of monosaccharides (e.g. galactose, mannose, fructose) – its role, disorders
40. Biosynthesis and degradation of oligosaccharides (e.g. importance, disorders)
41. Glycogenesis (e.g. regulation, importance, disorders)
42. Glycogenolysis (e.g. regulation, disorders)
43. Metabolism of amino sugars – reactions and biochemical importance
44. Disorders in saccharide metabolism
45. β -oxidation of fatty acids (e.g. energetic balance, regulation, role of carnitine, importance, disorders)
46. α and ω oxidation, degradation of FA with branched chain and odd number of carbons
47. Biosynthesis of FA - saturated, unsaturated (e.g. regulation, importance, disorders)
48. Biosynthesis and degradation of triacylglycerols (e.g. regulation, importance, disorders)
49. Biosynthesis and degradation of glycerophospholipids (e.g. regulation, importance, disorders)
50. Metabolism of sphingolipids and glycolipids (e.g. regulation, importance, disorders)
51. Eicosanoids - classification, biosynthesis, importance
52. Formation and degradation of ketone bodies (e.g. importance, disorders)
53. Biosynthesis of cholesterol – regulation, disorders
54. Metabolic fate of cholesterol

55. Disorders in metabolism of lipids
56. Biosynthesis and degradation of steroid hormones
57. Bile acids – biosynthesis and importance
58. Formation and importance of vitamin D, disorders in deficiency of vitamin D and other isoprene compounds
59. Digestion, absorption and catabolism of complex lipids
60. Lipoproteins – structure and their distributions
61. Biological function, composition and degradation of chylomicrons
62. Biological function, composition and degradation of VLDL, LDL, HDL
63. Disturbances in lipoprotein metabolism
64. Essential and nonessential amino acids (e.g. synthesis, degradation, importance in metabolism)
65. Glucogenic amino acids – role in intermediary metabolism
66. Ketogenic amino acids – role in intermediary metabolism
67. Degradation reaction of amino acids (e.g. transamination, decarboxylation, deamination)
68. Formation of ammonia in the organism and its fate (e.g. transport, detoxification)
69. Urea cycle – reactions, energetic balance, mechanism, importance, disorders
70. Conversion of carbon skeleton of amino acids – examples
71. Metabolism of glycine, alanine and serine (synthesis, degradation, disorders)
72. Metabolism of threonine and lysine (synthesis, degradation, disorders)
73. Metabolism of amino acids containing sulphur (synthesis, degradation, disorders)
74. Metabolism of aspartate and glutamate (synthesis, degradation, disorders)
75. Metabolism of valine, leucine and isoleucine (synthesis, degradation, disorders)
76. Metabolism of phenylalanine and tyrosine (synthesis, degradation, disorders)
77. Metabolism of histidine, proline and arginine (synthesis, degradation, disorders)
78. Metabolism of tryptophan (synthesis, degradation, disorders)
79. Importance of AA in synthesis of other compound
80. Biosynthesis, conversion of creatine and creatinine, role in metabolism
81. Catecholamines - formation, function and degradation
82. Amino acids and peptides as neurotransmitters
83. Biogenic amines - formation and function
84. Role and importance of THF and SAM in metabolism of AA
85. Disorders in metabolism of AA
86. Biosynthesis of pyrimidine nucleotides – reactions, importance, regulation
87. Degradation of pyrimidine nucleotides - reactions, importance, regulation
88. Biosynthesis of purine nucleotides - reactions, importance, regulation
89. Degradation of purine nucleotides - reactions, importance, regulation
90. Biosynthesis deoxyribonucleotides - reactions, importance
91. Cyclic nucleotides and their importance in regulatory reactions
92. Biosynthesis of nucleotide coenzymes (NAD, FAD, CoA)
93. Degradation NA, nucleotides and nucleosides
94. Importance salvage reactions of nitrogen bases and nucleosides
95. Disorders in metabolism of nucleotides
96. DNA (e.g. structure, denaturation and renaturation)
97. RNA (e.g. structure, role, function, types)
98. Arrangement of genetic material in DNA, genes, exons and introns
99. Extra nuclear forms of DNA – mitochondrial DNA, plasmids
100. Biosynthesis of DNA in eukaryotic and prokaryotic cells
101. Corrections in DNA – reparation of DNA, enzymes
102. Biosynthesis of RNA in prokaryotic and eukaryotic cells
103. Biosynthesis of ribosomal RNA
104. Biosynthesis of transfer RNA
105. Biosynthesis of messenger RNA
106. Proteosynthesis in prokaryotic cells, genetic code
107. Proteosynthesis in eukaryotic cells, genetic code
108. Cotranslational and posttranslational modification of proteins
109. Formation of proteins and chaperons – postsynthetic corrections
110. Synthesis of secretory and membrane proteins

111. Distribution of newly synthesized proteins – targetins
112. Inhibition of proteosynthesis by exogenic substances
113. Regulation of gene expression in eukaryotic and prokaryotic cells (e.g. peron theory)
114. Mutations and biologic effects of mutations
115. Gene manipulation (e.g. restriction endonucleases, cloning, gene therapy)
116. DNA methods (e.g. amplification – PCR, sequencing, hybridization)
117. Transcription of DNA (e.g. regulation, induction, repression)
118. Replication of DNA (e.g. regulation, enzymes, correction mechanisms)
119. Inhibitors in biosynthesis of nucleic acids
120. Mutual relation between metabolism of saccharides and lipids
121. Mutual relation between metabolism of saccharides and proteins
122. Mutual relation between metabolism of lipids and proteins
123. Structures of haemoglobin and its function
124. Biosynthesis of haemoglobin. Porphyrins and regulation of biosynthesis of heme, disorders
125. Degradation of haemoglobin, disorders
126. Conjugated and non-conjugated bilirubin. Disorders in excretion of bile pigments – icterus
127. Involvement of water in metabolism and its functions in living systems
128. Blood, its composition and function
129. Proteins of blood plasma, determination methods
130. Peculiarities in metabolism of glucose in erythrocytes
131. Biochemical mechanism of hemocoagulation
132. Transport of O₂ and CO₂. Mechanisms and disorders
133. Acid-base balance. Buffer systems. Disorders
134. Metabolism Na, Mg and K, their regulation and associated diseases
135. Metabolism of Ca, its regulation and associated diseases
136. Metabolism of Zn, Cu, Mn, Co, Se and their disorders
137. Transport and function of iron in the organism
138. Biochemical aspects of nutrition. Energetic value of food
139. Nutritional disorders – starvation (kwashiorkor, marasmus, anorexia, bulimia, obesity)
140. Role of saccharides in nutrition – biochemical aspects
141. Role of lipids in nutrition – biochemical aspects
142. Role of proteins in nutrition – biochemical aspects
143. Digestion and reabsorption of saccharides
144. Digestion of proteins in the GIT and reabsorbtion of cleaved products
145. Digestion of nucleoproteins and NA in the GIT
146. Digestion of lipids in the GIT, reserve fat
147. Digestions processes in the mouth and stomach
148. Digestion in small intestine – biochemical processes, enzymes
149. Hormones - chemical structure, significance
150. Mechanisms of hormone action with receptors on surface of cells, structure of receptors
151. Mechanism of the action of hormones with intracellular receptors, structure of receptor molecule
152. Mediators – neurotransmitters, structure, function
153. Formation and role of NO
154. Role of Ca²⁺ and phospholipase during action of hormones
155. Biochemistry of liver
156. Biochemistry of vision
157. Biochemistry of neural tissue
158. Biochemistry of the kidneys
159. Biochemistry of skin
160. Biochemistry of extracellular matrix (e.g. collagens, GAG)
161. Composition and metabolism of hard tissue
162. Biochemical functions of skeletal, cardiac and smooth muscle. Biochemistry of muscle contractions
163. Metabolism of xenobiotics - types of biotransformation reactions, conjugative reactions
164. Factors affecting reliability of biochemical results and their interpretation
165. Biological material and its processing in clinical biochemistry