

# **ORAL QUESTIONS FOR EXAMINATION FROM MEDICAL BIOCHEMISTRY**

## BIOLOGIC OXIDATIONS

1. Ways of oxidation of compounds in cells, enzymes and coenzymes of oxidation-reduction reactions
2. Electron transfer in respiratory chain, terminal oxidation, Mitchell theory
3. Synthesis of ATP in the process of oxidative phosphorylation, phosphorylation at the substrate level
4. Energy rich compounds - their synthesis and significance
5. Transport across biological membranes

## CITRIC ACID CYCLE

6. Sources for acetyl-CoA synthesis, main ways of acetyl-CoA utilization
7. Conversion of pyruvate into acetyl-CoA, enzymes and coenzymes of pyruvate dehydrogenase complex
8. Oxidation of acetyl-CoA in mitochondria - reactions of Krebs cycle
9. Significance of citric acid cycle for energy metabolism, energy yield and regulation of Krebs cycle
10. Meaning of citric acid cycle for metabolism of carbohydrates, lipids and amino acids

## CARBOHYDRATES

11. Sources of carbohydrates in food, digestion of carbohydrates and their absorption from the intestine
12. Degradation of glucose by glycolysis in aerobic conditions (reactions, enzymes)
13. Significance of aerobic glycolysis for energy metabolism of the cell, energy yield of glycolysis in aerobic conditions
14. Degradation of glucose by glycolysis in anaerobic conditions, energy yield, further utilization of lactate
15. Metabolic and hormonal regulation of glycolysis
16. Reversibility of reactions of glycolysis, bypass of irreversible reactions in gluconeogenesis
17. Gluconeogenesis - utilization of non-carbohydrate compounds for glucose synthesis, inter-organ cooperation
18. Metabolic and hormonal regulation of gluconeogenesis
19. Synthesis of carbohydrate stores in the body and their mobilization, synthesis and degradation of glycogen
20. Metabolic and hormonal regulation of glycogen metabolism
21. Pentose phosphate pathway and its significance
22. NADPH - synthesis in the cell and significance for cellular metabolism
23. Hormonal regulation of blood glucose level
24. Defects of hormonal regulation of glucose metabolism - diabetes mellitus and its metabolic consequences

## LIPIDS

25. Digestion and absorption of lipids in the intestine, transport of exogenous lipids in the body
26. Oxidation of fatty acids - activation, transport into mitochondria,  $\beta$ -oxidation
27. Significance of  $\beta$ -oxidation for the energy metabolism of the cell, energy yield of  $\beta$ -oxidation
28. Lipoproteins - composition, synthesis and significance of individual lipoproteins
29. Transport of cholesterol in the body, role of lipoproteins in cholesterol metabolism
30. Transport of exogenous and endogenous triacylglycerols and roles of apoproteins in their metabolism
31. Roles of liver and adipose tissue in lipid metabolism, synthesis of lipid stores and their mobilization

32. Ketone bodies - their synthesis and significance. Synthesis of ketone bodies in pathologic conditions

### AMINO ACIDS

33. Deamination of amino acids - oxidative deamination, transamination, deamination of serine and cysteine
34. Production of ammonia in the cells, fixation of ammonia, transport of ammonia and its utilization
35. Sources of ammonia in the blood. Detoxification of ammonia, inter-organ relationships
36. Transamination of amino acids, roles of transamination reactions in amino acid metabolism
37. Metabolism of phenylalanine and tyrosine. Defects in metabolism of phenylalanine and tyrosine
38. Metabolism of one-carbon groups
39. Synthesis of creatine and creatinine. Excretion of creatinine and use of creatinine for examination of kidney function
40. Synthesis of non-essential amino acids

### NUCLEOTIDES

41. Significance of nucleotides for metabolism
42. Synthesis of IMP by de novo pathway and its regulation
43. Synthesis of AMP and GMP from IMP. Regulation of purine nucleotide synthesis
44. Synthesis of pyrimidine nucleotides de novo Synthesis of CTP and regulation of pyrimidine nucleotide synthesis, synthesis of TMP
45. Salvage pathways of purine nucleotide synthesis
46. Degradation of purine nucleotides
47. Synthesis of uric acid and its excretion. Hyperuricaemia - gout

### REGULATIONS

48. Enzymes and their role in regulation of metabolism. Mechanisms of regulation of enzyme activities in the cells
49. Covalent modifications of enzyme proteins and their role in regulation of metabolism
50. Mechanisms of transfer of chemical signals into the cells
51. G-proteins and their role in mediation of regulatory effects
52. cAMP - its synthesis and degradation. Role of cAMP in regulation of metabolism
53. Phosphatidylinositols and their roles in regulation of metabolism
54. Vegetative nervous system. Neurotransmitters of vegetative nervous system, role of vegetative nervous system in regulation of metabolism and physiologic functions
55. Synthesis and degradation of neurotransmitters of adrenergic neurotransmission
56. Synthesis and degradation of neurotransmitters of cholinergic neurotransmission
57. Cholinergic receptors and mechanism of transfer of the information after their stimulation
58. Adrenergic receptors and mechanism of transfer of the information after their stimulation

### HORMONES

59. General mechanisms of hormone action
60. Calcitropic factors (parathyroid hormone, calcitonin, vitamin D) and their roles in regulation of calcium and phosphate metabolism
61. Hormones of pancreas - their roles in regulation of metabolism, regulation of their secretion
62. Hormones of adrenal cortex - their metabolic roles and regulation of their secretion
63. Hormones of adrenal medulla - their synthesis, metabolic and physiologic effects

### VITAMINS

64. Vitamins and their significance as the coenzymes in metabolism of carbohydrates, lipids and proteins
65. Folic acid and vitamin B<sub>12</sub> - their roles in metabolism of one-carbon groups

### DIGESTION AND LIVER FUNCTIONS

66. Composition of digestive juices, their secretion and regulation of the process

67. Roles of stomach and pancreas in the process of digestion
68. Synthesis of heme and its regulation. Biological roles of heme proteins
69. Degradation of hemoglobin - bile pigments their synthesis and transport in the body
70. Roles of liver in bilirubin metabolism
71. Icterus - (jaundice) - classification and diagnostics
72. Bile - composition and meaning
73. Liver - basic functions in metabolism of carbohydrates, lipids and proteins
74. Role of liver in regulation of blood glucose
75. Blood plasma proteins and their functions in the body

#### WATER AND MINERAL METABOLISM

76. Roles of water, Na<sup>+</sup>, K<sup>+</sup> and Cl<sup>-</sup> in the body and regulation of their metabolism
77. Acid-base balance - buffer systems in the blood, role of respiratory system and kidney in maintenance of pH
78. Defects in acid-base balance - acidosis and alkalosis, metabolic and respiratory. Compensation of acidosis and alkalosis
79. Functions of the kidney - excretion, maintenance of homeostasis, metabolic roles, regulation of blood pressure

#### INTRODUCTION INTO CLINICAL BIOCHEMISTRY

80. Enzymes in blood plasma and their significance for biochemical diagnosis