федеральное государственное бюджетное образовательное учреждение высшего образования «Кемеровский государственный медицинский университет» Министерства здравоохранения Российской Федерации

УТВЕРЖДАЮ
Заведующий кафедрой фармацевтической и общей химии
к. фарм. н. доцент Мальцева Е. М.
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24 января 2025 г.

TYPICAL QUESTIONS FOR INTERMEDIATE ATTESTATION
«chemistry»
for foreign students of the therapeutic faculty
full-time education
II semester

1. Spatial structure of organic molecules. Configurational and conformational isomers.
2. Conjugation as a factor for increasing the stability of molecules, π, π-and p, π-conjugation.
3. Aromaticity and its criteria.
4. Bond polarization and electronic effects (inductive and mesomeric). Electron-donating and electron-acceptor substituents.
5. The protolytic Brensted-Lowry theory of acids and bases.
6. Factors affecting the acidity and basicity of organic substances.
7. Types of covalent bonds' rupture in organic molecules. Free radicals, electrophiles, and nucleophiles.
8. Reactions of electrophilic addition and substitution.
9. Nucleophilic addition reactions: reactions of formation of semi-acetals and acetals; hydration reactions; disproportionation reactions; reactions with amines.
10. Oxidation reactions of alcohols, aldehydes, and thiols. Reduction reactions of aldehydes and ketones.
11. Comparative activity of acylating reagents.
12. Nucleophilic substitution reactions in carboxylic acids and their functional derivatives: O-acylation: preparation of acid anhydrides and esters; N-acylation; S-acylation.
13. The role of acid catalysis in reactions of nucleophilic substitution: esterification.
14. Natural higher fatty acids: palmitic, stearic, oleic, linoleic, linolenic, arachidonic.
15. Fats. Structure, acidic and alkaline hydrolysis of neutral fats.
16. Phospholipids. Phosphatidic acids. Phosphatidylcholine phosphatidylcholines, phosphatidylserine. Acid and alkaline hydrolysis of phospholipids.

17. Heterofunctional compounds. Fischer's projection formulas. Optical activity of molecules. Stereochemical nomenclature: D-and L-molecules. Stereoisomers: enantiomers, diastereomers.

18. Heterocyclic compounds. Structure of pyrrole and pyridine nitrogen. Aromaticity of heterocyclic compounds.

19. Structure of pyrimidine (uracil, thymine, cytosine) and purine (adenine, guanine) bases. Tautomeric forms.

20. Structure and properties of hydroxy and oxoacids that are natural metabolites.

21. Classification, nomenclature and structure of α-amino acids that are part of proteins.

22. Stereoisomerism of α-amino acids.

23. Acid-base properties of α-amino acids, bipolar structure.

24. Isoelectric point of α-amino acids.

25. Non-oxidative and oxidative deamination of α-amino acids.

26. Hydroxylation of α-amino acids.

27. Decarboxylation of α-amino acids.

28.Ttransamination reaction of α-amino acids.

29. Formation of intra-complex salts with α-amino acids.

30. Isoelectric point of peptides.

31. Acidic and alkaline hydrolysis of peptides.

32. Spatial structure of peptides and proteins (secondary, tertiary and quaternary structures).

33. Types of bonds between amino acid radicals during the formation of the tertiary structure of protein (ionic, hydrogen, hydrophobic, disulfide).

34. Classification and structure of monosaccharides (glucose, galactose, mannose, fructose, ribose, xylose and their derivatives (2-deoxyribose, glucosamine).

35. Fischer's open monosaccharide formulas, D-and L-stereochemical series.

36. Cyclic Haworth projections of monosaccharides, α - and β-anomers.

37. Oxidation reactions of monosaccharides in alkaline medium.

38. The reduction reaction of monosaccharides.

39. Reaction of glycosides (O-, N-glycosides) formation of monosaccharides.

40. Esterification (phosphorylation, sulfonation) of monosaccharides.

41. Alkylation, acylation of monosaccharides.

42. The structure of disaccharides (maltose, cellobiose, lactose, sucrose).

43. Reducing properties of disaccharides.

44. Hydrolysis of disaccharides.

45. Structure of homo-and heteropolysaccharides: starch (amylose, amylopectin), glycogen, cellulose, hyaluronic acid.

46. Classification, nomenclature and structure of nucleosides.

47. Classification, nomenclature and structure of nucleotides.

48. The principle structure of polynucleotide chain.

49. Primary structure of RNA.

50. Spatial structure of DNA (primary, secondary, tertiary structures).

51. The principle of complementarity of nucleic bases in the formation of the secondary structure of DNA.

52. Methods for expressing the composition of solutions (formulas, units of measurement):

53. density of solutions (units of measurement), method of measurement.

54. Raoult's law. The freezing point depression, calculation methods.

55. Osmosis, osmotic pressure.

56. Van't-Hoff's law for osmotic pressure of solutions of non-electrolytes and electrolytes. Isotonic coefficient.

57. Osmotic pressure of biological fluids.

58. Hypo -, Hyper-and isotonic solutions. Endosmosis and exosmosis (plasmolysis, cytolysis, hemolysis).

59. The role of osmosis in biological systems.

60. Oncotic pressure of blood.

61. Enthalpy and thermal effect of a chemical reaction. 1st law of thermodynamics.

62. Exothermic and endothermic processes.

63. Hess's Law and its consequences.

64. Caloric content of protein, fat, and carbohydrates.

65. Entropy as a function of the state of the system.

66. Gibbs Energy as a criterion for the direction of the process.

67. Exer-and endergonic biochemical processes. The principle of energy coupling.

68. Chemical equilibrium. The law of active masses for chemical equilibrium.

69. Features of the equilibrium constant.

70. Shifting of chemical equilibrium, the Le Chatelier’s principle.

71. The chemical reaction rate and its dependence on nature, concentration of reacting substances, and temperature.

72. Activation energy. Arrhenius equation.

73. Molecularity and order of the reaction. Kinetic equations of reactions of the first order.

74. The period of poljoprivredne.

75. Features of enzymatic catalysis.

76. Nomenclature and classification of complex compounds.

77. The concept of the complex substances' structure of (complexing agents, ligands, coordination number).

78. Understanding of the structure of biocomplexes (hemoglobin, metalloenzymes).

79. Constants of instability/stability of complex ions.

80. Chelation therapy.

81. RedOx systems, electrode and RedOx potentials.

82. Dependence of the RedOx potential on various factors. Nernst Equations.

83. Prediction of the RedOx processes' direction using the value of RedOx potentials. Electro motive force.

84. Strong and weak electrolytes. Constant and degree of ionization of a weak electrolyte.

85. Autoprotolysis of water. Autoprotolysis constant.

86. Hydrogen index (pH), methods of its calculation and measurement.

87. pH Value of some biological fluids: blood, gastric juice, saliva, urine.

88. The Concept of the acid-base state of the body.

89. Protolytic buffer systems and solutions: classification, composition.

90.The mechanism of buffers' action: bicarbonate, hydrophosphate, acetate, ammonia.

91. Calculation of the pH of acidic and basic buffer systems (Henderson-Hasselbach equations).

92. Area of buffer action and buffer capacity.

93. Adsorption.

94. Surface-active (surfactants) and surface inactive substances.

95. Duclos-Traube rule, adsorption isotherms.

96. Dialysis.

97. Structure of colloidal particles (micelles).

98. Factors affecting the stability of sols. Coagulation.

99. The threshold of coagulation and its definition. The Schulze Hardy Rule.

100. Colloids in the body. Examples.