CONTROL AND MEASURING DEVICES

Questions of the border control program 2

OP: 6B10115-"Medicine"

Discipline Code: Him 1202

Discipline: "Chemistry"

Amount of study hours/ credits: 120h/4k

Course 1 Semester I
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1. Classification and nomenclature of organic compounds. A functional group. Structural isomerism and structural isomers. Homological series and homological difference. Give examples.
2. What is the mutual influence of atoms in a molecule? Polarization of coupling, inductive and mesomeric effects. Electron-donating and electron-acceptor substituents and their effect on the reactivity of the double bond and the aromatic core. Substituents of the 1st and 2nd kind and their orienting effect in the aromatic core. Confirm the answer with examples.
3. Acidity and basicity of organic compounds. The Brensted-Lowry theory. Comparative characteristics of acidic properties of alcohols, phenols, thiols, carboxylic acids, amines. Electronic effect of substituents on acidity.
4. 4. Reaction centers of carboxylic acids. Reactions occurring along the CH-acid center of the α-carbon atom. Reactions of nucleophilic substitution (S_N) at the trigonal carbon atom in carboxylic acids (using the example of the etherification reaction).
5. Reactions of nucleophilic addition to a trigonal carbon atom (aldehydes, ketones) using the example of obtaining semi-acetals and acetals. Comparison of the reactivity of aldehydes and ketones.
6. Oxidation and reduction reactions of organic compounds. Oxidation of alkenes, alcohols, thiols, and aldehydes. Reduction of aldehydes and ketones. The concept of the action of the NAD system===NADH.
7. Amino alcohols: aminoethanol (colamine). Conversion scheme: serine-colamine-choline-acetylcholine.
8. Aminophenols: dopamine, norepinephrine, adrenaline and their biological role.
9. Hydroxy acids. Specific reactions occurring during heating of α, β, γ-hydroxyacids.
10. Amino acids. Specific reactions occurring during heating of α, β, γ-acids.
11. Aldehyde and ketonic acids: pyruvic, acetoacetic, oxaloacetic, α-ketoglutaric. Keto-enol tautomerism.
12. Salicylic acid and its derivatives (acetylsalicylic acid, methyl salicylate). medical use.
13. Sulfanilic acid and its amide (streptocide). Synthesis from aniline. Medical use.
14. p-Aminobenzoic acid and its derivatives (anesthetic, novocaine), their use in medical practice.
15. Amino acids that make up proteins. Classification. The biological role of the structure of amino acids. Stereoisomerism. Acid-base properties.
16. Chemical properties of amino acids as heterofunctional compounds. Reactions of amino acids with nitric acid and formaldehyde, their significance for the analysis of amino acids.
17. Formation of peptides. The nomenclature. The structure of the peptide bond. Hydrolysis of peptides and determination of amino acid composition.
18. Specify the functional group and determine which class of organic compounds they belong to: CH_3CH_2OH, CH_3-CHO, C_6H_5-NH_2,, CH_2OH-CH_2NH_2, C_6H_5-NO_2
19. Name the following compounds according to international and rational nomenclature: CH_3-CO-CH_3; C_2H_5-O-C_2H_5; CH_3-CH_2-COOH.
20. Name the compound CH_3-CH(CH_3)-CH_2-CH_3 and identify the primary, secondary and tertiary carbon atoms.
21. Determine the type and sign of electronic effects in the following organic molecules: phenol and nitrobenzene.

22. Determine the type and sign of electronic effects in the following organic molecules: aniline and benzoic acid.
23. Determine the type and sign of electronic effects in the following organic molecules: ethanol and benzaldehyde.
24. Give a comparative description of the acidic properties of ethanol, ethanethiol, and ethylamine. Justify your answer.
25. Give a comparative description of the acidic properties of ethanol and phenol. Justify your answer.
26. Give a comparative description of the acidic properties of acetic acid, chloroacetic acid, dichloroacetic acid, and trichloroacetic acid. Justify the answer.
27. Give a comparative description of the main ethylamine and aniline. Justify your answer.
28. Compare the basicity of aniline, p-methylaniline and p-nitroaniline. Justify your answer.
29. Explain keto-enol tautomerism using the example of acetoacetic ether.
30. Name the compound HOOC-CHOH-COOH according to international and trivial nomenclature.
31. Name the compound HOOC-CHOH-CH_2-COOH according to international and trivial nomenclature.
32. Name the compound HOOC-CHOH-CHOH-COOH according to international and trivial nomenclature.
33. Name the compound HOOC-$CHNH_2$-COOH according to international and trivial nomenclature.
34. Name the compound H_3C-CHOH-$CHNH_2$-COOH according to international and trivial nomenclature.
35. Write the formula for citric acid. What functional groups does citric acid contain?
36. Give the structural formula of streptocide (sulfanilic acid amide) and name its use in medical practice.
37. Give the structural formulas of anesthetic and novacaine (derivatives of p-aminobenzoic acid) and name their use in medical practice.
38. Write a diagram of the reaction of acetic aldehyde with one molecule of ethanol. Name the final product.
39. Write a diagram of the reaction of acetic acid with ethyl alcohol. Explain the role of acid catalysis and name the product.
40. Write a diagram of the reaction of benzoic acid with methanol. Explain the role of acid catalysis and name the resulting product.
41. What kind of product will be obtained by heating oxalic acid.
42. Write a scheme for obtaining the drug aspirin (acetylsalicylic acid) and name its use in medical practice.
43. Pyridine and its derivatives: nicotinic acid, its amide.
44. Indole. Tryptophan, reactions leading to the formation of tryptamine, serotonin. The biological role of serotonin.
45. Пурин. Мочевая кислота (2,6,8-гидроксипурин). Лактам-лактимная таутомерия мочевой кислоты. Подагра.
46. Barbituric acid. Keto-enol and lactam-lactimic tautomerism. Medicinal preparations are derivatives of barbituric acid.
47. Classification of monosaccharides. Aldoses, ketoses, representatives.Stereoisomerism and cyclo-oxo-tautomerism of monosaccharides. The image of monosaccharides. Fischer and Haworth formulas.

48. Chemical properties of monosaccharides. Reactions of carbonyl and hydroxyl groups.
49. Disaccharides. Classification. Representatives: maltose, lactose, sucrose, cellobiose. Structure and properties.
50. Polysaccharides: starch, glycogen, cellulose, dextran, hyaluronic acid, chondroitin sulfates. Structure, biological role.
51. Biologically important heterocyclic compounds. Five- and six-membered heterocyclic compounds.
52. Alkaloids. Classification of alkaloids and their significance in medicine.
53. Nucleic acids, representatives, biological role. Complementarity of nitrogenous bases. Hydrogen bonds in complementary pairs of nucleic bases.
54. Nitrogenous bases of the pyrimidine series, which are part of nucleic acids. Lactam is lactimic tautomerism. Nitrogenous bases of the purine series. Aromatic properties, lactam-lactimic tautomerism.
55. Nucleosides. The structure of purine and pyrimidine mononucleosides.
56. The nucleotides. The structure of mononucleotides. The nomenclature. Hydrolysis of nucleotides.
57. The primary structure of nucleic acids. Phosphodiester bond. The nature of differences between DNA and RNA (in structure and function).
58. The structure of ATP. Macroergic connections. Hydrolysis of ATP. Biological role.
59. Neutral lipids (triglycerols). Structure, biological role.
60. Natural higher fatty acids included in lipids: palmitic, stearic, oleic, linoleic, arachidonic, linolenic.
61. Vegetable and animal fats. Structure, properties. Analytical characteristics of fats.
62. Unsaponifiable lipids. Isoprenoids.Terpenes, steroids, carotenoids. Cholesterol and its importance for health. The biological role of steroids in living organisms.
63. Phospholipids. Building. Biological role.
64. Peroxidation of unsaturated fatty acid fragments in cell membranes, its mechanism. Antioxidants.
65. Write a scheme for obtaining the drug cordiamine (nicotinic acid diethylamide).
66. Write a scheme for obtaining vitamin PP (nicotinic acid amide).
67. Give the structural formulas of tubazide (isonicotinic acid hydrazide) and ftivazide. What are they used for in medical practice?
68. Write the structural formulas of the pyrimidine bases: uracil, thymine, and cytosine. Explain lactim-lactam tautomerism using their example.
69. Write the structural formulas of purine bases: adenine and guanine. Explain lactim-lactam tautomerism using their example.
70. Write the structure of the Alpha-Val-Tre tripeptide. Specify the peptide bond, C- and N-ends.
71. Write down the structure of the Sulfur-Glycol tripeptide. Specify the peptide bond, C- and N-ends.
72. Give the structural formula of the adenosine-5-phosphate nucleotide and specify the glycoside and ester bonds in it.
73. Give the structural formula of the deoxyguanosine-5-phosphate nucleotide and indicate the glycoside and ester bonds in it.
74. Give the structural formula of the cytidine-5-phosphate nucleotide and indicate the glycoside and ester bonds in it.

75. Give the structural formula of the uridine-5-phosphate nucleotide and indicate the glycoside and ester bonds in it.
76. Give the structural formula of the thymidine-5-phosphate nucleotide and indicate the glycoside and ester bonds in it.
77. Give the structural formula of the deoxycytidine-5-phosphate nucleotide and indicate the glycoside and ester bonds in it.
78. Give the structure of a fragment of the primary DNA structure of Y-A and explain their biological functions.
79. Give the structure of a fragment of the primary structure of G-T RNA and explain their biological functions.