"APPROVED"

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The list of questions for preparation for practical studies, independent work and the final module control and examinations

List of questions for independent work of students

1. Determine the structure of the hydrocarbon composition of C6 H12, if it bleaches bromine water and a solution of potassium permanganate, when oxidized with a chromium blend, forms acetone and propionic acid. Write the equation of reactions, and also give the structural formula of alcohol formed during hydration of this hydrocarbon.

2. Under the action of an alcoholic solution of alkali on isomeric halogenalkanes of the general formula C6N13Vg, a hydrocarbon of the composition of C6H12 is obtained, with the oxidation of which acetone and propionic acid are formed. Determine the structure of isomeric haloalkanes and hydrocarbons. Give all the reaction equations.

3. Determine the structure of ethylene hydrocarbon, which during hydrogenation in the presence of catalysts forms 2-methylpentane, and in the case of ozonolysis - acetic and isosalic aldehydes. Write for this hydrocarbon scheme of the oxidation reaction under different conditions.

4. The ethylene hydrocarbon of the C5H10 composition during the ozonolysis forms acetone and acetic aldehyde. Dehydration of which spirits can it be synthesized? Provide structural formulas for hydrocarbons and alcohols. Write the reaction equation and the dehydration mechanism.

5. Determine the structure of the ethylene hydrocarbon composition of the C5H10, if it during the hydration in the presence of sulfuric acid forms a secondary alcohol, when oxidized under severe conditions - a mixture of antinea and isosalic acids. Give the scheme of hydrohalogenic hydrohalogenation, direct the mechanism.

6. Determine the structural formula of the hydrocarbon composition of C4H6, if it binds four atoms of hydrogen, reacts with an ammonium solution of copper oxide (I). What product forms this hydrocarbon under the conditions of Kucherov's reaction?

7. The carbohydrate of the composition C6H10 attaches two molecules of bromine, with ammonium chloride solution of copper CuCl forms a brown precipitate, oxidized to a mixture of isopropyl acetate and carbonic acid. Determine the structure of the hydrocarbon. Write the reaction equation.

8. Determine the structure of acetylene hydrocarbon composition of C6H10, if it forms a 2-methylpentane in hydrogenation, reacts with sodium amide. What products are formed when oxidizing this hydrocarbon? Write all the reaction equations.

9. Determine the structure of the hydrocarbon composition of C7H12, if it does not form organometallic compounds, attach 4 bromine atoms, oxidize to a mixture of propionic and isosalic acid. What compounds are formed when it is hydrogenated. Write the reaction equation.

10. Determine the structure of the hydrocarbon composition of the C6H10, if it binds 4 bromine atoms, reacts with Diels-Alder with maleic anhydride, and when formed by formaldehyde and dimethylglyoxal, it forms an ozonolysis.

11. A substance of the C4H5CI composition binds to 4 hydrogen atoms to form a C4H9CI halogenalkane, which is transformed into 3,4-dimethylhexane by the Wurtz reaction. Vis-start the structure of the compound C4H5CI, if it is polymerized with the formation of synthetic rubber, with maleic anhydride, Dils-Alder reaction.

12. Determine the structure of the hydrocarbon composition of C10H22, if: 1). it can be obtained by the Wurtz reaction from the primary haloalkane without the impurities of by-products; 2). when nitrating it on the Konovalov reaction, a tertiary mononitro compound is formed. When the primary halogen derivative is recovered, from which hydrocarbons are extracted, 2-methylbutane is formed, and at the cleavage of 2-methylbutene-1 halogenated water.

13. When heated potassium salt of isovalerylate acid with alkali formed hydrocarbon composition of C4H10. What structure does it have? Write for it the equation of reactions of nitration, chlorination, sulfoclora tion. Indicate the peculiarities of these reactions.

14. The carbohydrate of the C6H14 composition can be obtained by the Wurtz reaction without the admixture of other hydrocarbons. When it is brominated, a tertiary monobrom is formed. Put the mechanism of the bromination reaction on an example of this hydrocarbon. From salts of which carboxylic acids it can be extracted?

15. Determine the structure of the hydrocarbon composition of C6H14, if it can be obtained by the Wurtz reaction without the impurities of other hydrocarbons. When

nitrating this hydrocarbon for Konovalov, a secondary mononitreous is formed. Which compounds are formed during bromination, sulfocluorination. Write the equation and conditions of all reactions, the mechanism of the reaction of sulphonylation.

16. From the hydrocarbon composition of the C4H10, you must have the Bromo derivative of C4H9Br, which, when used in conjunction with sodium acetylenide, forms a hydrocarbon with a tertiary carbon atom. Name all compounds. Provide reactions that can be used to distinguish the starting hydrocarbon, bromo derivative and the final product.

17. Give the schemes of extraction of the indicated compounds. Place them in a row to increase the main properties, specify the main centers and electronic effects, explain the reasons for increasing the basicity of the positions of stability of the formed cation: *aniline, o-nitroaniline, o-phenylenediamine.*

18. - "- Aniline, o-phenylenediamine, p-toluidine

19. - "- Pentylamine, diethylamine, diphenylamine.

20. - "- Toluidine, Cresol, Benzene.

21. - "- 1 - Naphthylamine, 4-nitronaphthylamine, dimethylamine.

22. - "- Ethylamine, Ethylene, Ethanol.

23. - "- Methylmercaptan, methylamine, isopropylamine, tert-butylamine.

24. - "- N, N-Dimethylaniline, N-ethylaniline, o-ethylaniline.

25. - "- Dimethyl ether, ethanol, ethylmercaptan.

26. - "- Butylamine, butene-2, t-butylamine.

27. For what quantities the strength of organic acids is quantified. What factors influence the values of these variables. Give the structural formulas and values of the constants of the acidity of the compounds:

a). acetone, acetic acid and its amide;

b). ethanol and ethylmercaptan;

c). phenol, 4-nitrophenol, 4-aminophenol.

Explain the dependence of the magnitude of the constants on the structure of the molecule.

28. What factors determine the strength of organic acids? Compare the stability of formed anions, place in a row to increase the acidic properties: methanol, sec-butanol, tert-butanol. Provide schemes for their extraction.

29. Prove the amphoteric properties of amino alcohols on an example of collamine. Provide schemes for its extraction and transformation under action:

a). sulfuric acid;

b). one and two molecules of oxirane;

c). thionyl chloride.

Provide a schematic of obtaining hapitot.

30. Which of the following compounds:

a). formaldehyde;

b). propionic aldehyde;

c). acetic aldehyde;

g). benzoic aldehyde do not react according to the scheme of aldol condensation. Explain the reason. What transformation occurs with these compounds in the presence of KOH. Give the schemes of all reactions, the reaction mechanism on the example of one aldehyde.

List of questions for preparation for practical classes

1. Classification of organic compounds in the structure of the carbon chain? Which classes are the compounds?

a). toluene;

b). butane;

c). propine;

d). hexene;

e). butine-2?

Provide reaction schemes by which these compounds can be obtained. By what reactions it is possible to distinguish compounds c), d).

2.Classification of organic compounds by the nature of functional groups. Lead for each class: class name, functional group, general formula and example. Provide schemes for the extraction of methane, chloromethane, nitromethane, methylamine.

3. Define the concept of substituent and functional group. Which classes are the compounds?

a) $C2H5Cl$

b) $CH3\text{-}CH2\text{-}CH2\text{-}OH$

c) $HO\text{-}CH2\text{-}CH2\text{-}NH2$

d) $C6H5NH2$;

e) $CH3\text{-}CH\ (CH3)\ \text{-}CH2\text{-}Cl$

Provide schemes for the extraction of these compounds. By what reactions can we distinguish compounds a), b), d)? Name all compounds.

4. Define the notion of a homologous series, a homologous difference. Bring homologous methane series. To which homologous series are the compounds:

a) $CH3\text{-}\ (CH2)\ 2\text{-}CH2\text{-}C1$;

b) $CH3\text{-}CH2\text{-}CH = CH2$;

c) $CH3\text{-}CH2\text{-}CH2\text{-}C{\equiv}CN$

g) $C4H9OH$

Give the schemes of transformations of the compounds a) → г); g) → a); a) → b); g) → b). How to distinguish compounds a) and b)?

5. Name the most important nomenclature systems. What are the principles behind them? Name the substituent and radical functional nomenclature of the IUPAC compound:

a) $CH_3-CH_2-CH_2-Cl$

b) $CH_3-CH(CH_3)-Cl$

c) $CH_3-CH_2-O-CH_3$

d) $CH_3-CH_2-NH_2$;

e) $(CH_3-CH_2)_2NH$.

Provide schemes for the extraction of these compounds. By what reactions it is possible to prove the presence of amino groups in compounds d) and e)

6. Formulate the basic rules for the name of the organic compound under the substitute nomenclature IUPAC. Name these rules of the compound:

a) acetylene;

b) isoprene;

c) ethylene glycol;

d) chlorine

Provide schemes for obtaining each compound and the reaction by which they can be distinguished.

7. The first valence state of the carbon atom: sp3 hybridization. Formation and construction of sp3-hybridized atomic orbitals (AO) of carbon. Electronic structure of molecules of methane, ethane. Give two ways to get heptane. Give its possible isomers, name the isomerism type.

8. The second valence state of the carbon atom: sp2-hybridization. Formation and construction of sp2-hybridized atomic orbitals (AO) of carbon. The electronic structure of the ethane molecule. Synthesize with three methods of hexene-1. Provide structural formulas for all possible isomers of hexene-1. What are the types of isomerism?

9. The third valence state of the carbon atom: sp-hybridization. Formation and structure of sp-hybridized atomic orbitals (AO) of carbon. The electronic structure of the molecule of acetylene. Give three ways to synthesize hexin-2. Give all its possible isomers, name the isomerism types.

10. Covalent □ - and □-bond. The electronic structure of single, double and triple carbon-carbon bonds and their characteristics (length, energy, polarity, polarization ability) Provide extraction methods, structural formulas of the structure, and specify

the types of bonds in the compounds butene-1, butyn- 2, 2-chloropentane, 3-iodopentane. Compare the polarity of the bonds.

11. Give the definition of the concept of a radical. Give examples of primary, secondary and tertiary radicals. Name them. Give examples and titles. Write formulas for the structure of chlorinated compounds containing the following radicals:

a). vinyl-;

b). allyl;

c). phenyl-;

d). benzyl-.

Provide reaction schemes for the extraction of these compounds. Compare the mobility (reactivity) of the chlorine atom in compounds c). and d).

12. Specify the types of bonds in the molecules:

a) butane;

b) butine-1;

c) sodium acetate;

g). d) methylammonium chloride;

e) triethylamine oxide

Give a definition of each type of communication. Provide synthesis schemes for each compound. What reactions can one prove to be the presence of a triple bond in the butyne-1 molecule?

13. Hydrogen bond, intermolecular, intramolecular. Give examples. How does the formation of a hydrogen bond affect the physical properties of organic compounds. Value of hydrogen bond in biochemical processes. What is alcohol contracting? Which of the following compounds form hydrogen bonds:

a). cyclohexane;

b). propanol-2;

c). ethanic acid;

d). Butadiene-1,2.

Provide schemes for the extraction of each of these compounds.

14. Give the definition of isomerism, isomer. Give a classification of isomers. You define the notion of structural isomerism, name the types of structural isomerism. Provide all possible isomers of the structure for the compounds:

a). ethylisopropyl ketone;

b). 3,4-dibromobutan-1.

Provide schemes for the extraction of these compounds.

15. Give the definition of the concept of inductive effect, conjugate system, mesomeric effect. Graphically indicate the type and sign of electronic effects in the molecules of vinyl chloride, benzyl chloride, chlorobenzene. Provide schemes for the extraction of these compounds, compare the reactivity of the chlorine atom in the nucleophilic substitution reactions (SN).

16. Classification of reactions of organic compounds by direction and mechanism. Make diagrams, conditions and determine the mechanisms of bromination reactions:

a). propane;

b). propane;

c). benzene

Explain the reasons for the different mechanisms of the course of these reactions. Provide a mechanism for the interaction of propene with bromine.

17. Give the definition of the concept of optical isomerism. Under what conditions this kind of isomerism arises. How are optical isomers depicted? Write down all Fisher's projection formulas for tartaric acid. Give a definition of enantiomer, diastereomer, mesoform, racemic form.

18. Give definitions of conformation and configuration, conformational isomerism and configuration isomerism. What are the types of conformational and configuration isomerism, give examples of isomers.

19. Formulate the rules of orientation in the reactions of electrophilic substitution (SE) in the benzene core. Give the definition of the substitutes I and II. Graphically depict the redistribution of electronic density in the molecules of toluene, chlorobenzene, nitrobenzene. Provide schemas, conditions and reaction products for nitration of these compounds.

20. Give the definition of free radical, carbocation, carbanion. Imagine their electronic structure and explain how the substituents at the carbon atom are affected by their stabilization. Explain the illustrations with examples. Provide schemes for the formation of a radical, carbocation, and carbonyion from triphenylmethane. Explain the reason for their stability and color.

21. Give the definition of the concept of a-nitro-tautomeria. For which compounds it is characteristic. Give examples. What is the significance for identifying organic spoons?

22. Get the primary, secondary and tertiary nitrobutanas. How do these nitrobutanes behave when adding a solution of sodium hydroxide? Explain the reason. Provide schematics. What does this reaction mean?

23. Obtain three isomeric compounds of the general formula C5H11NO2. By what reaction can they be distinguished? Provide schematics.

24. Pass the Zinin reaction in an alkaline medium, for example, p-nitrotoluene. Specify all classes of compounds that can be obtained by this reaction. What restorers can be used?

25. Compare the course of the Zinin reaction in acidic and neutral media, for example, of o-ethylbenzene. What classes of compounds can be distinguished in these conditions? Which restorers are used? What compounds are extracted from arylhydroxylamines by the action of conc. sulfuric acid?

26. Get 1-nitrohexane and nitrobenzene. Specify the reaction schemes by which they can be distinguished.

27. What mechanisms of reaction are characteristic of nitrobenzene? Provide schematics. Specify electronic effects in the nitrobenzene molecule.

28. How does nitroarenes affect the reactivity of nitro groups? Belt on the examples. Compare the conditions for obtaining nitrobenzene and trinitrobenzene. Provide reaction schemes.

29. Give the definition of the nitro compound. Give the classification of nitro compounds (examples, titles), the structure of the nitro group. Get the primary and tertiary nitroalkanes, name the mechanisms by which the reactions occurred.

30. Compare the conditions for nitrating ethylbenzene to the aromatic core and the side chain. Give schemas, specify the mechanisms.

31. Compare the flow of nitration of phenol under different concentrations of nitric acid, explain the cause. Give schemas, name products.

32. Under what conditions aniline is nitrite in para- or meta-position? Explain the reasons, give schematics, name the products.

33. What compounds are formed under the influence of nitric acid on naphthalene, anthracene, phenanthrene? What are the consequences of these reactions?

34. What is the significance of the reaction of the restoration of nitro compounds, give diagrams of transformations in different conditions. What is the reaction called?

35. Hoffman's reaction. Possibilities of reaction. Refer to the reaction schemes for example 1-iodomethane and iodobenzene. Provide the reaction mechanism on the example of the first stage of obtaining the primary aliphatic amine.

36. Provide methods for producing the primary pentanamine (without impurities) through the derivative of phthalic acid and the amide of the corresponding acid of the aliphatic row. Name these reactions.

37. Give the definition of the term "amine", give their classification. Give examples and schemes of obtaining each name in the nomenclature IUPAC.

38. Give the definition of the term "metamerism," give the structural formulas of budes of metamers of the total composition of S5N11NH2. How to distinguish them, give the schemes of reactions, the names of the nomenclature IUPAC.

39. Give a definition of the concept of bases and acids for Brunswick-Lowry. What is called a conjugated base and a conjugate acid? What factors influence the strength of the basics? Show in the examples, explain.

40. How to classify organic bases. Give specific examples of the basics of each type, explain how the strength of the bases depends on their structure.

41. What are the characteristics of the strength of the foundation? What factors determine the strength of organic bases. Give specific examples, explain.

42. How does the strength of the basis depend on the number and nature of the substituents? Explain on examples of aliphatic and aromatic amines.

43. How does the solvent affect the basic properties of amines. Compare the basicity of metamorphic aliphatic amines in the gas phase and aqueous solution.

44. Give a definition of the concept of acids and bases for Lewis. Give examples of bases and schemes of acid-base processes.

45. Tell us about the rigid acids and bases (PFM) -Pyrson's principle. What is its significance?

46. Provide schemes for the extraction of these compounds. Place them in a row to increase the main properties, specify the main centers and electronic effects, explain the reasons for increasing the basicity of the positions of stability of the formed cation: *aniline, o-nitroaniline, o-phenylenediamine.*

47. - "- Aniline, o-phenylenediamine, p-toluidine

48. - "- Pentylamine, diethylamine, diphenylamine.

49. - "- Toluidine, Cresol, Benzene.

50. - "- 1 - Naphthylamine, 4-nitronaphthylamine, dimethylamine.

51. - "- Ethylamine, Ethylene, Ethanol.

52. - "- Methylmercaptan, methylamine, isopropylamine, tert-butylamine.

53. - "- N, N-Dimethylaniline, N-ethylaniline, o-ethylaniline.

54. - "- Dimethyl ether, ethanol, ethylmercaptan.

55. - "- Butylamine, butene-2, t-butylamine.

56. What substances are called azo dyes? Give the scheme of extraction of methyl red, show how the color changes depending on the pH.

57. Provide qualitative reactions to the primary aromatic amino group in toluidine.

58. Provide a general scheme, conditions and mechanism for the response of diazotization of aniline. What does this reaction mean?

59. Provide electronic effects in the aniline molecule, indicate which structural fragments of the molecule are possible chemical transformations. Refer to the reaction scheme for the amino group.

60. Indicate the scheme, mechanism and reaction conditions of the azo-coupling between benzodiazone chloride and 2-naphthol. Explain the orientation of the substitute. Name the azo- and di-azoscomponent. The value of the reaction.

61. Provide electronic effects in the aniline molecule, indicate which structural fragments of the molecule are possible chemical transformations. Give reaction schemes on the aromatic core.

62. Indicate the scheme, mechanism and reaction conditions of the azo-coupling between benzodiazone chloride and N, N-dimethylaniline. Explain the orientation of the substitute. Name the Azo- and Diazo Component. The value of the reaction.

63. For what purpose "protection" of amino groups is carried out? What is the reaction called, which reagents are used? Give the schemes of "protection" reactions and further nitration and hydrolysis. What product is formed if aniline is nitrated without the prior "protection"?

64. Provide methods for obtaining putrescine, o-m-phenylenediamine. By what reaction can it be distinguished putrescine?

65. The aromatic and aliphatic compound during the action of chloroform in the presence of KOH formed compounds with a very unpleasant odor. What are these compounds? Suggest examples of compounds and methods to distinguish them.

66. Give the course of the reaction that occurs when the aniline is heated from the end. sulfuric acid in a high boiling solvent. Compare the acidic and basic properties of sulfanilic acid and its amide. Under what name amide is used in medicine?

67. Indicate the reaction schemes of the diazo compounds that occur with the release of nitrogen. What classes of organic compounds can be obtained through aryldiazone chloride?

68. Give a definition of the class of diaozoosov, give their structure, isomerism, conditions and mechanism of formation.

69. What substances are called azo compounds? Indicate the scheme and name the reaction mechanism, which leads to the formation of hydroxyl and aminophodic azobenzene. How to get unsubstituted azobenzene?

70. What is a dye? What is the color of organic compounds? How does the color and its intensity depend on the structure of the molecule. What are spectral and extra colors? What are the main classes of dyes?

71. Give the scheme of obtaining methyl orange. How its color varies depending on the pH of the medium.

72. What colorant of the triphenylmethane series is used in medicine as an antiseptic. Give the scheme of its extraction. Explain the reason for the color.

73. What colorant is a hydroxy derivative triphenylmethane, used as an indicator on alkaline earthworm? Provide a drawing scheme, a color change? What does this compound have in medicine?

74. How are hydroxyl derivatives of hydrocarbons classified. Give examples of each type of compounds, their extraction.

75. Get the isomeric butanols known to you by all means. How to distinguish secondary alcohol from others?

76. Define the notion of acid by Brunstead-Lowry. How to classify acids. Give examples of acids of different types, and the schemes for their extraction

77. By what quantities the strength of organic acids is quantified. What factors influence the values of these variables. Give the structural formulas and values of the constants of the acidity of the compounds:

a). acetone, acetic acid and its amide;

b). ethanol and ethylmercaptan;

c). phenol, 4-nitrophenol, 4-aminophenol.

Explain the dependence of the magnitude of the constants on the structure of the molecule.

78. What factors determine the strength of organic acids? Compare the stability of formed anions, place in a row to increase the acidic properties: methanol, sec-butanol, tert-butanol. Provide schemes for their extraction.

79. In the example of propanol, give diagrams of reactions with acids:

a). acetic;

b). nitrogen;

c). sulfuric acid (in various ratios)

What are the reactions between alcohol and acid? Provide a mechanism for dehydration of alcohol in the presence of a catalytic amount of conc. sulfuric acid at a temperature below 170 °.

80. How can ethanol be converted to ethoxyethanum. Give the scheme, conditions, reaction mechanism. Provide an alternative reaction scheme. What reaction can we distinguish between ethanol and diethyl ether?

81. What is the reaction with ethanol to get ethen? Give the scheme, conditions, mechanism. Provide an alternative reaction scheme. How to distinguish between starting and end compounds?

82. Turn to halogen derivative methanol, isopropyl alcohol, t-pentanol, allyl alcohol, benzyl alcohol. Compare their reactivity in reaction with halogens. What are the reaction mechanisms? Provide mechanisms for the reaction of tertiary pentanol.

83. What is the significance of iodoform in a pharmaceutical analysis? Which of the spent compounds can be discovered by the formation of iodoform:

a) acetone

b) diethyl ether;

c) methanol;

d) butanol;

e) butanol-2?

Give the schemes of these reactions. Provide methods for obtaining acetone and methanol.

84. Compare the acidic properties of ethanol, ethanediol, propantria. Provide schemes for the extraction of these compounds, and their oxidation. Name all products.

85. By what reactions it is possible to distinguish ethyl alcohol, ethylene glycol, glycerol. What drug substance is a complex glycerin tietery, as used in medicine? Give the scheme of its extraction.

86. By what reactions it is possible to prove in the molecule of heptanediol-2,3 the presence of two vitsinal hydroxyl groups and their position. Suggest ways to obtain the compound of interest.

87. Get an o-, m-. p-aminophenols. Prove their amphotericity. Compare the acid and basic properties with phenol and aniline. Give oxidation products.

88. Give the scheme of formation of vinyl alcohol. What are the properties of the enol reflected in the rule of Eltekova-Ehrlenmaier? Give a definition of keto-enol tautomerism. Bring products known to you to convert vinyl alcohol.

89. Prove the amphoteric properties of amino alcohols on the example of collamine. Provide schemes for its extraction and transformation under action:

a) sulfuric acid;

b) one and two molecules of oxirane;

c) thionyl chloride.

Provide a schematic of obtaining hapitot.

90. Give the definition of phenols, give them a classification, examples. Determine the electronic effects of the hydroxyl group. Compare the acidic properties of phenols and alcohols, confirm it with chemical reactions. Provide methods for obtaining o-cresol, α- and β-naphthols.

91. Provide schemes for the extraction of phenol, electronic effects of the hydroxyl group, qualitative reactions to phenol.

92. List the schemes of phenol reactions in the hydroxyl group. Compare the acidic properties of phenol and benzoic acid, prove it with reactions. By what reactions can phenol be identified?

93. Explain the conditions and reasons for the exhaustive (complete) bromination of phenol. How to change the reaction conditions to stop it at the stage of formation of a mono- or dibromic derivative? What is the significance of bromination of phenols?

94. Get a ketone, aldehyde, carboxylic acid and azo dye from phenol. Name all reactions, specify mechanisms.

95. Get from benzene pyrokatechin, resorcinol and hydroquinone. How can they be distinguished? Compare Acid Properties:

and). mono- and diphenols; b). diphenols and aminophenols.

96. Obtain methylmercaptan and thiophenol. Compare the acidic properties of thiols and their oxygen-containing analogues. How is the compound called dimethoxide used? Suggest a scheme for its extraction.

97. Provide schemes for the extraction of diethyl ether, anisole and phenethol. Determine electronic effects in molecules. How can ethoxyethan be identified? How is it used in medicine?

98. What oxo compounds should be used in the synthesis of Grignard to convert ethyl bromide to: a). propanol; b). butanol-2; in). 2-methylbutanol-2? Provide reaction schemes. Compare the reactivity of the original oxo compounds in the joining reactions.

99. Give the classification of compounds containing the carbonyl group, examples and names. Synthesize butanol and butanone in three ways. How can they be distinguished?

100. The structure of the carbonyl group. What types of reactions are characteristic of aldehydes and ketones? Give examples.

101. Compare the reactivity of formaldehyde, acetic aldehyde, acetone, chlorine in nucleophilic addition reactions. Provide schemes for the extraction of these compounds.

102. Refer to the example of propionic aldehyde, to direct all the joining-splitting reactions. Name all compounds. What is the significance of these reactions? Give an example of the use of a reaction to identify organic compounds because of the appearance of color.

103. Which of the following compounds:

a). formaldehyde;

b). propionic aldehyde;

c). acetic aldehyde;

d). benzoic aldehyde

do not react according to the scheme of aldol condensation. Explain the reason. What transformation occurs with these compounds in the presence of KOH. Give the schemes of all reactions, the reaction mechanism on the example of one aldehyde.

104. Provide schemes for the extraction of benzaldehyde and acetophenone from benzene. Name the reaction. Specify electronic effects in molecules. Compare the behavior of these compounds in the reactions: a) with chlorine; b) Conc. nitric and sulfuric acids.

105. Give a scheme of condensation of benzaldehyde with two molecules of diethylaniline. What color is the compound formed? Explain the reason for changing the color after the formation of salt with oxalic acid. Where is the name and the name of the salt used?

106. For which of the following compounds:

a). benzaldehyde;

b). glyoxal;

c) acetone;

d) propionic aldehyde;

e). acetic aldehyde

Aldol condensation is possible. Give the schemes of all possible reactions, on the example of one compound - the mechanism of the reaction.

107. What is the reaction of condensation to obtain ethyl acetate. Name the other reaction that leads to its formation. What is the significance of the last reaction to identify organic compounds? Provide schemas and mechanisms for both reactions.

108. Provide schemes for acetone and acetic aldehyde extraction. What happens to aqueous formaldehyde solution, acetone and acetaldehyde (in the presence of traces of sulfuric acid) at room temperature and at 0 ° C? What is "dry alcohol"?

109. Provide schemes for the production of anthelium and acetic aldehydes. Compare their reactivity in the reaction with ammonia, present the reaction schemes. Provide a mechanism for the formation of aldimin on the example of acetic aldehyde. How and under which name is used formic aldehyde and product of its reaction with ammonia?

110. Give the schemes of synthesis of hexanone-3 and ethanal. Compare the deposition and oxidation of ketones and aldehydes in their examples. Give schematics, specify the conditions, the value of the reactions.

111. Give the schemes of synthesis of the first representatives of the homologous series of dialdehydes and diketones, conduct reactions with hydroxylamine. What compound is used in analytical chemistry under the name of Chugayev reagent. Provide the reaction scheme with the corresponding cation. Which of these dioxo compounds reacts to Cannitszaro? Provide conditions and scheme.

Questions for final module 1

1. Classification of organic reactions. Mechanism of butane nitration.

2. Alkanes. Homologous series of straight-chained alkanes. Type of atomic hybridization and bonding in alkanes. Write products of hexane cracking.

3. The electronic structure of ethane. Sp^3-hybridization of atomic orbitals in ethane. Preparations of ethane.

4. Butane. Isomerism of butane. What types of reactions are typical for butane?

5. What rections are typical for alkanes? Write reaction of 2-methylpropane sulphochlorination. Demonstrate the mechanism of this reaction.

6. Write reactions of 2-methylbutane sulphochlorination, nitration and sulfonation.

7. Write all possible products of Wurtz reaction between chloroethane and 2-chlorobutane. Which of them has two optical isomers?

8. Explain the σ-bond formation in propane. What type of rections is typical for alkanes? Preparation of propane. Mechanism of propane nitration.

9. Mechanism of butene-1 hydrohalogenation. Compare reactivity of hydrogen halides in this reaction. Markovnicov’s rule.

10. Baeyer test for hexene-2. Ozonation of hexene-2.

11. Write chemical reactions for butene-1 with following reagents:

a) Br_2 (CCl_4); *b)* HBr;

c) H_2O (H^+); *d)* H_2SO_4.

Demonstrate the mechanism for butene-1 hydrobromination reaction.

12. Write reduction and oxidation reactions for hexene-2.

13. Compare the reactivity of hydrogen halides in propen-2 hydrohalogenation reactions. Markovnicov’s rule.

14. The electronic structure of ethyne. Sp-hybridization of atomic orbitals in ethene. Preparations of ethyne.

15. The electronic structure of ethene. Sp^2-hybridization of atomic orbitals in ethene. Preparations of ethene

16. Write reactions of butadiene-1,3 bromination. Types of atomic hybridization and bonds in butadiene-1,3.

17. Mechanism of 1,3-butadiene hydrohalogenation.

18. Kucherov reaction of acetylene and dimethylacetycene. El’tekov rule.

19. Write substitution reactions for terminal alkynes.

20. Mechanism of butyne-1 and butadiene-1,3 hydrohalogenation.

21. Preparations of acetylene. Write reaction of acetylene transformation into methylacetylene.

22. Reactions of acetylene and methylacetylene di- and trimerization.

23. Halogenation of butadiene-1,3 and butyne-1. Demonstrate the mechanism for one of these reactions.

24. Write reduction and oxidation reactions for methylacetylene and dimethylacetylene.

25. Write reactions of complete pentyne-2 oxidation with:

a) $KMnO_4$ *(*H_2O*);* *b)* $KMnO_4$ *(NaOH).*

26. The electronic structure of naphthalene. Rules of aromaticity. Preparations of naphtalene.

27.Compare reactivity of toluene and nitrobenzene in S_E reactions. Write chemical reactions with CH_3Br. Demonstrate the mechanism for one of them.

28.Compare reactivity of phenol and benzoic acid in S_E reactions. Write chemical reactions with HNO_3. Demonstrate the mechanism for one of them.

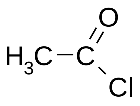
29.Compare reactivity of aminobenzene and nitrobenzene in S_E reactions. Write chemical reactions with H_2SO_4. Demonstrate the mechanism for one of them.

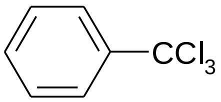
30.Compare reactivity of toluene and trichloromethylbenzene in S_E reactions. Write chemical reactions with Cl_2. Demonstrate the mechanism for one of them.

31.Compare reactivity of ethylbenzene and chlorobenzene in S_E reactions. Write chemical reactions with HNO_3. Demonstrate the mechanism for one of them.

32.Compare reactivity of chlorobenzene and nitrobenzene in S_E reactions. Write chemical reactions with Cl_2. Demonstrate the mechanism for one of them.

33.Compare reactivity of toluene and trichloromethylbenzene in S_E reactions. Write chemical reactions with Cl_2. Demonstrate the mechanism for one of them.

34.Compare reactivity of toluene and nitrobenzene in S_E reactions. Write chemical reactions with  $H_3C-C(=O)Cl$. Demonstrate the mechanism for one of them.

35.Compare reactivity of toluene and trichloromethylbenzene () in S_E reactions. Write chemical reactions with Cl_2. Demonstrate the mechanism for one of them.