

МІНІСТЕРСТВО ОСВІТИ І НАУКИ УКРАЇНИ
ДВНЗ «Ужгородський національний університет»
Приймальна комісія

ЗАТВЕРДЖУЮ

Голова приймальної комісії
ДВНЗ «УжНУ», ректор



[Signature] проф. В.І. Смоланка

18.03. 2021 р.

ПРОГРАМА

вступного іспиту з хімії

для вступників на навчання

для здобуття освітнього ступеня “бакалавр” (магістр)

(на основі повної загальної середньої освіти,

для вступників – іноземних громадян)

РОЗРОБЛЕНО

Предметною екзаменаційною комісією

з хімії *Баден Діас і.О.*

Голова комісії

List of questions for the exam

1. Subject and tasks of chemistry. The place of chemistry in the natural sciences.
2. Physical and chemical phenomena.
3. Ecological problems of chemistry. The role of chemistry in the protection of the environment.
4. Atomic-molecular theory.
5. Molecules. Atoms.
6. Constancy of substance composition.
7. Relative atomic and relative molecular mass.
8. Law of mass conservation, its importance in chemistry.
9. Quantity of substance. Mole.
10. Molar mass.
11. The Law of Avogadro and the molar volume of gas.
12. Volumetric ratios of gases in reactions.
13. Chemical element, simple and complex substances.
14. Chemical compounds and mechanical mixtures.
15. Chemical symbols and chemical formulas.
16. Valency and degree of oxidation.
17. Calculations of the mass fraction of the chemical element in the substance by the formula.
18. Establishment of the chemical formula of the substance by its composition.
19. Chemical equations.
20. Calculations according to the chemical equations of the practical output of the reaction products and the mass or volume of reaction products if the reagents contain impurities.
21. Composition of atomic nuclei (protons and neutrons).
22. The concept of radioactive decay of chemical elements.
23. Isotopes.
24. The structure of electron shells of atoms of chemical elements of small periods.
25. Features of the structure of atoms of elements of large periods (on the example of the IV period).
26. The opening of Mendeleev's periodic law and the creation of a periodic system of elements.
27. Modern formulation of the periodic law.
28. Large and small periods, groups and subgroups.
29. Dependence of the properties of elements from the position in the periodic system.
30. Frequency of change of properties of simple substances and compounds of elements.
31. The meaning of the periodic law.
32. Electronegativity of chemical elements and chemical connection.
33. Covalent connection (polar and nonpolar).
34. Connection energy.
35. Donor-acceptor mechanism of covalent connection formation.
36. Ionic connection, its difference from covalent.
37. Hydrogen connection.
38. Classification of chemical reactions.
39. Reactions of combination, scheduling, replacement, exchange.
40. Irreversible and reversible chemical reactions.
41. Chemical equilibrium.
42. Concept of equilibrium constant.
43. Conditions of displacement of chemical equilibrium.
44. The principle of Le Chatelier.
45. Thermal effect of chemical reactions, thermochemical equations.
46. Redox reactions.
47. Oxidation and recovery processes.
48. The value of redox reactions in nature and technology.
49. Speed of chemical reactions.

50. Dependence of the reaction rate on the nature of the reactants.
51. Dependence of reaction rate on concentration.
52. Dependence of the reaction rate on the surface area of contact of the reactants.
53. Dependence of reaction rate on temperature.
54. Catalysis and catalysts.
55. Catalytic and non-catalytic reactions.
56. Value of catalytic processes.
57. Solutions.
58. Solubility of substances.
59. Dependence of solubility of substances on their nature.
60. Dependence of solubility of substances on temperature.
61. Dependence of solubility of substances on pressure.
62. Thermal effects at dissolution.
63. Methods of quantitative expression of the composition of solutions: mass fraction and molar concentration.
64. Density of solutions.
65. The concept of crystalline hydrates.
66. Preparation of aqueous solutions of solid, liquid, gaseous substances with a certain mass fraction of dissolved substance.
67. Electrolytic dissociation.
68. Rate of dissociation.
69. Degree of dissociation.
70. Strong and weak electrolytes.
71. Properties of alkalis, acids and salts by the theory of electrolytic dissociation.
72. Oxides. Classification of oxides.
73. Methods of extraction, properties and application of oxides.
74. Alkalis, their composition and names.
75. Hydroxy group. Insoluble bases and alkalis, their chemical properties.
76. Neutralization reaction.
77. Amphoteric hydroxides, their properties.
78. Receiving the alkalis.
79. Acids, their composition and names.
80. Classification of acids.
81. Physical and chemical properties, methods of receiving of acids.
82. Salts, their composition and name. Classification of salts.
83. Chemical properties of salts.
84. Extraction of salts.
85. The concept of acid's salts and complex compounds.
86. The concept of hydrolysis of salts.
87. Genetic link between oxides, alkalis, acids and salts.
88. The position of the Hydrogen in the Periodic System, the chemical properties of hydrogen: the interaction with nonmetals, metal oxides, organic matter.
89. Production of hydrogen in the laboratory and industry.
90. Application of hydrogen as an environmentally friendly fuel and raw material for the chemical industry.
91. Oxygen, atomic structure, propagation in nature.
92. Oxygen, its physical and chemical properties, extraction and application.
93. Air. Air pollution protection.
94. Water. Chemical properties and using of water.
95. Water purification. Creation of non-waste technologies.
96. Circulation of water in nature.
97. Chlorine, reactions with inorganic and organic substances.
98. Chlorination, its extraction and properties.
99. Hydrochloric acid, its salts.

100. General characteristics of elements of the main subgroup of group VI of the periodic system.
101. Sulfur, its physical and chemical properties.
102. Oxides of sulfur (IV) and sulfur (VI), their extraction, chemical properties, application.
103. Sulfuric acid, its properties.
104. Chemical reactions that underlie the production of sulfuric acid in a contact way, and patterns of their flow.
105. Oxidizing properties of concentrated sulfuric acid.
106. Nitrogen, position in the periodic system, atomic structure.
107. Nitrogen, its physical and chemical properties.
108. Ammonia, its industrial synthesis, physical and chemical properties.
109. Ammonium salts. Oxides of nitrogen (II) and nitrogen (IV).
110. Chemistry of the production of nitric acid.
111. Chemical features of nitric acid. Nitrates.
112. Nitrogen fertilizers.
113. General characteristics of elements of the main subgroup V of the periodic system.
114. Phosphorus, its allotropic forms, chemical and physical properties.
115. Phosphorus oxide (V), orthophosphoric acid and its salts.
116. Phosphate fertilizers.
117. Carbon, position in the periodic system, atomic structure, allotropic forms.
118. Chemical properties of carbon.
119. Oxides of carbon (II) and (IV), their chemical properties.
120. Carbonic acid and its salts.
121. Transformation of carbonates in nature.
122. General characteristics of elements of the main subgroup of group IV periodic system.
123. Silicon, its chemical properties.
124. Silica oxide (IV), silicon acid and its salts.
125. Building materials: glass, cement, concrete.
126. Metals, their positions in the periodic system, feature the structure of atoms.
127. Metal connection.
128. Electrochemical range of metal's potentials.
129. Characteristic physical and chemical properties of metals.
130. The concept of corrosion and way of resistance it.
131. Alkali metals, their characteristics according to the position in the periodic system and the structure of atoms.
132. Chemical compounds of Sodium and Potassium in nature.
133. Potassium fertilizers.
134. Sodium and potassium hydroxides, their chemical properties, extraction, application.
135. Calcium, characteristic of the position in the periodic system and structure of the atom, its chemical compounds in nature.
136. Calcium oxide and hydroxide, their chemical properties, extraction and application.
137. Qualitative reactions on calcium and barium ions.
138. Aluminum, characteristic of an element and its compounds by position in a periodic system.
139. Amphotericity of aluminum oxide and hydroxide.
140. Aluminum compounds in nature, its role in industry.
141. Ferum, atomic structure and distribution in nature.
142. Chemical properties of iron, its oxides and hydroxides.
143. Chemical reactions in production of cast iron and steel.
144. The role of iron and its alloys in industry.
145. Metals in modern industry.
146. The main methods of industrial extraction of metals: recovery of coal, carbon monoxide (II), hydrogen, aluminotermia, electrochemical methods of extraction of metals from their compounds.
147. Theory of the chemical structure of organic compounds O. Butlerova.
148. Dependence of the properties of organic substances on the chemical structure.
149. Isomeria.

150. The electronic nature of chemical connections in molecules of organic compounds.
151. Ways of breaking a chemical bondings, the concept of free radicals.
152. Homologous series of saturated carbohydrates (alkanes), their electronic and spatial structure, sp^3 -hybridization.
153. Nomenclature of alkanes, their physical and chemical properties. Methane.
154. Saturated hydrocarbons in nature, their application.
155. Ethylene carbohydrates (alkenes), their electronic structure, sp^2 -hybridization, d- and p-connections, double connection.
156. Isomerism, nomenclature and chemical properties of ethylene hydrocarbons, the rule of Markovnikov.
157. Ethylene, extraction and application in industry.
158. General concepts of chemistry of high-molecular-weight compounds: monomer, polymer, elementary chain, degree of polymerization.
159. Polyethylene and polypropylene, their structure, properties and application.
160. Natural rubber, its structure and properties.
161. Synthetic rubber.
162. Acetylene, peculiarities of its structure, sp -hybridization, triple connection.
163. Acetylene extraction by carbide and methane, chemical properties, application.
164. Homologous series and nomenclature of acetylene hydrocarbons, application.
165. Benzene, its electronic structure.
166. Chemical properties of benzene.
167. Industrial extraction and application of benzene.
168. The concept of the mutual influence of atoms on the example of toluene.
169. Natural sources of hydrocarbons: petroleum, natural and associated petroleum gases, coal.
170. Distillation of oil.
171. Cracking of petroleum products, coal coking.
172. Alcohols, their structure, nomenclature.
173. Hydrogen connection and its influence on the physical properties of alcohols.
174. Chemical properties of saturated monoatomic alcohols.
175. Industrial synthesis and application of methanol, ethanol.
176. The concept of polyhydric alcohols, properties and application of glycerol.
177. Phenol, its structure, the mutual influence of atoms in a molecule.
178. Chemical properties of phenol in comparison with the properties of alcohols and benzene.
179. Application of phenol.
180. Aldehydes, their electronic structure.
181. Nomenclature of aldehydes.
182. Chemical properties of aldehydes.
183. Extraction and application of formic and acetic aldehydes.
184. Carboxylic acids: electronic structure of the carboxyl group, homologous series.
185. Saturated monobasic carboxylic acids: structure, nomenclature, extraction, physical and chemical properties.
186. The main representatives of monobasic carboxylic acids: acetic, stearic, palmitic, oleic acids and their salts. Soap.
187. Interconnection between hydrocarbons, alcohols, aldehydes and carboxylic acids.
188. Esters, their structure, extraction by the reaction of esterification, chemical properties.
189. Fats as representatives of esters, their role in nature, chemical processing.
190. Glucose, its structure, chemical properties, role in nature.
191. Sucrose, its hydrolysis, general scheme of sugar production.
192. Starch, cellulose, their structure, chemical properties, role in nature and technical application.
193. Chemistry of photosynthesis.
194. Concept of artificial fibers.
195. Amino acids, their structure, chemical properties.
196. Polycondensation reaction.
197. Synthetic fiber kapron.

198. Peptide connection.
199. Proteins, composition of their molecules, chemical structure.
200. Biological role of proteins.
201. The role of chemistry in the life of society: the national importance of chemistry, the use of chemical industry products.
202. Chemistry and ecology, the importance of chemistry for understanding the scientific picture of the world.

Evaluation criteria, evaluation structure, procedure for assessing the readiness of entrants.

The entrance exam in chemistry is a written control of the entrant's knowledge. Written works are evaluated from 100 to 200 points. The total amount written tasks-20. All tasks have a short answer. Each of them provides a solution problem. If everything is done correctly, the entrant receives 20 points for it, otherwise – 0 points. The work takes 60 minutes.