

**Federal State Budgetary Educational Institution of Higher Education  
«Pavlov First Saint Petersburg State Medical University»  
of the Ministry of Health of the Russian Federation  
(FSBEI of HI PFSPbSMU)**



Approved  
Rector of FSBEI of HI PFSPbSMU  
of the Ministry of Health of Russia  
S. F. Bagnenko

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*N 241-8 on 25.10.2022*

**Evaluation Criteria for Entrance Distant Testing in Chemistry for Applicants to the FSBEI of  
HI PFSPbSMU**

**CONTENTS AND STRUCTURE OF THE EXAMINATION TEST IN CHEMISTRY**

**CRITERIA FOR EVALUATION**

The content and structure of exam tests in chemistry are developed in accordance with the recommendations of the test materials of the Unified State Exam approved by the Ministry of Science and Higher Education ([www.fipi.ru](http://www.fipi.ru)).

The examination test consists of tasks based on the materials of several thematic blocks.

Task number	Task content	Grading criteria	The maximum score for completing the task	Task execution time (min)
<b>Part 1. Basic level (computer testing)</b>				
1	The structure of nuclei and electron shells of atoms of chemical elements.	2 points are given for the correct answer; 0 points are given for an incorrect answer or its absence.	2	2–3
2	The periodic law and structure of the periodic system.	2 points are given for the correct answer; 0 points are given for an incorrect answer or its absence.	2	2–3
3	Types of chemical bonds: covalent (polar and nonpolar), ionic, hydrogen, metal.	2 points are given for the correct answer; 0 points are given for an incorrect answer or its absence.	2	2–3
4, 5	Classes of inorganic compounds: oxides, acids, hydroxides, salts (classification, nomenclature).	2 points are given for the correct answer; 0 points are given for an incorrect answer or its absence.	2	2–3

6, 7	The rate of chemical reactions and its dependence on various factors. Chemical reaction rate constant. Catalysis. Thermal effects of chemical reactions. Reversibility of reactions. Chemical equilibrium and conditions for its shift.	2 points are given for the correct answer; 0 points are given for an incorrect answer or its absence.	2	2-3
8	Hydrolysis of salts, types of hydrolysis.	2 points are given for the correct answer; 0 points are given for an incorrect answer or its absence.	2	2-3
9	Electrolysis of inorganic salts.	2 points are given for the correct answer; 0 points are given for an incorrect answer or its absence.	2	2-3
10	Redox reactions. The most common oxidising and reducing agents.	2 points are given for the correct answer; 0 points are given for an incorrect answer or its absence.	2	2-3
11-14	The structural theory of organic compounds by A. M. Butlerov. Isomerism. Homologous series.	2 points are given for the correct answer; 0 points are given for an incorrect answer or its absence.	2	2-3
15	Electronic and spatial structure of molecules. The concept of hybridisation of atomic orbitals. The concept of the mutual influence of atoms in molecules.	2 points are given for the correct answer; 0 points are given for an incorrect answer or its absence.	2	2-3
16	Hydrocarbons: alkanes, cycloalkanes, alkenes, alkynes, dienes, aromatic hydrocarbons (physical and chemical properties, production methods).	2 points are given for the correct answer; 0 points are given for an incorrect answer or its absence.	2	2-3
17	Oxygen-containing compounds: monohydric and polyhydric alcohols, phenols, aldehydes, ketones, carboxylic acids, ethers and esters (physical and chemical properties,	2 points are given for the correct answer; 0 points are given for an incorrect answer or its absence.	2	2-3

	production methods, biomedical significance).			
18	Qualitative reactions to various classes of organic compounds.	2 points are given for the correct answer; 0 points are given for an incorrect answer or its absence.	2	2-3
19, 20	Acid-base properties of organic compounds.	2 points are given for the correct answer; 0 points are given for an incorrect answer or its absence.	2	2-3
<b>Part 2. Advanced level (computer testing)</b>				
21	Methods for producing various classes of inorganic compounds.	For each correctly established correspondence or correctly selected statement, 3 points are given.	9	4-5
22	Methods for producing various classes of organic compounds.	For each correctly established correspondence or correctly selected statement, 3 points are given.	9	4-5
23	A calculation task in inorganic chemistry.	6 points are given for a correct answer; 0 points are given for an incorrect answer or its absence.	6	15
24	A calculation task in organic chemistry.	6 points are given for a correct answer; 0 points are given for an incorrect answer or its absence.	6	15
<b>Part 3. Theoretical questions (situational tasks)</b>				
25	A question in inorganic chemistry.	For each correct answer, 2 points are given (up to 6 points); for each correct explanation of the chosen answer, 3 points are given (up to 9 points); if the applicant is not able to give the correct answer or explain his choice, 0 points are given.	15	5 minutes to answer
26	A question in organic chemistry.	For each correct answer, 2 points are given (up to 6 points); for each correct explanation of the chosen	15	5 minutes to answer

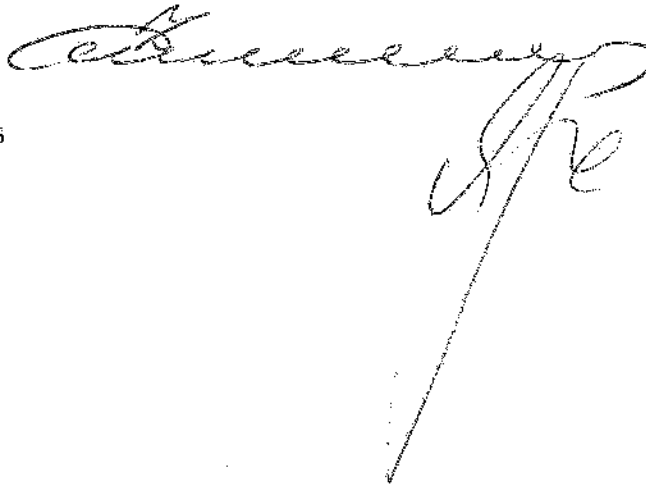
		answer, 3 points are given (up to 9 points); if the applicant is not able to give the correct answer or explain his choice, 0 points are given.		
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Head of the Department of General and Bioorganic Chemistry

K. N. Semenov

APPROVED:

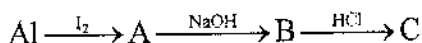
Vice-rector for Academic Affairs



A. I. Yaremenko

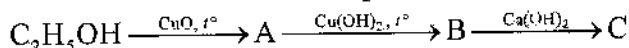


16. The reduction of butanal with hydrogen leads to the formation  
 a) butan-2-ol                                      b) butan-1-ol                                      c) but-1-ene                                      d) but-2-ene.
17. Select a substance that does not react with acetic acid  
 a)  $\text{Na}_2\text{SO}_4$                                       b)  $\text{CuO}$                                       c)  $\text{Cu}(\text{OH})_2$                                       d)  $\text{Na}_2\text{CO}_3$ .
18. Determine the sign of the reaction between phenol and bromine water  
 a) solution discolouration and the formation of a white precipitate  
 b) solution discolouration and the formation of a brown precipitate  
 c) solution discolouration without precipitation  
 d) formation of a solution with an intense blue colour.
19. Select a compound possessing acidic properties  
 a) methane                                      b) cyclopropane                                      c) propadiene                                      d) propan-1-ol.
20. Select an organic compound possessing basic properties  
 a) butylamine                                      b) nitroethane                                      c) ammonia                                      d) ethanol.
21. Indicate intermediate substances in the reaction sequence



- |   |                            |                             |                             |
|---|----------------------------|-----------------------------|-----------------------------|
| A | 1) HI                      | 2) HIO                      | 3) $\text{AlI}_3$           |
| B | 1) $\text{Al}_2\text{O}_3$ | 2) Al                       | 3) $\text{Al}(\text{OH})_3$ |
| C | 1) $\text{Al}_2\text{O}_3$ | 2) $\text{Al}(\text{OH})_3$ | 3) $\text{AlCl}_3$          |

22. Indicate intermediate substances in the reaction sequence



- |   |  |  |   |
|---|--|--|---|
| A | 1) $\text{CH}_3\text{CHO}$                       | 2) $\text{CH}_3\text{COOH}$                    | 3) $(\text{CH}_3\text{COO})_2\text{Cu}$ |
| B | 1) $\text{C}_2\text{H}_5\text{COOH}$             | 2) $\text{CH}_3\text{COOH}$                    | 3) $(\text{CH}_3\text{COO})_2\text{Cu}$ |
| C | 1) $(\text{C}_2\text{H}_5\text{COO})_2\text{Ca}$ | 2) $(\text{C}_2\text{H}_5\text{O})_2\text{Ca}$ | 3) $(\text{CH}_3\text{COO})_2\text{Ca}$ |

23. When calcium carbonate was heated, part of the substance decomposed and 3.36 litres of gas were released. The mass of the solid residue was 18.4 g. This residue was added to 200 g of hydrochloric acid taken in excess. Determine the mass fraction of salt in the solution.

- |         |         |         |
|---------|---------|---------|
| a) 13 % | b) 26 % | c) 49 % |
| d) 57 % | e) 62 % | f) 73 % |

24. On combustion of 2 g of saturated monohydric alcohol, 4.4 g of carbon dioxide and 2.4 g of water were formed. The vapour density of the substance in relation to hydrogen is 30. Determine the molecular formula of the substance.

- |                                       |                                       |                                    |
|---------------------------------------|---------------------------------------|------------------------------------|
| a) $\text{C}_6\text{H}_{13}\text{OH}$ | b) $\text{C}_5\text{H}_{11}\text{OH}$ | c) $\text{CH}_3\text{OH}$          |
| d) $\text{C}_2\text{H}_5\text{OH}$    | e) $\text{C}_3\text{H}_7\text{OH}$    | f) $\text{C}_4\text{H}_9\text{OH}$ |

### Oral part

25. Establish a correspondence between reactants and products. Explain the answer based on the properties of inorganic compounds.

- |   |   |   |
|---|---|---|
| A) $\text{MgO} + \text{SO}_2 \rightarrow$           | 1) $\text{MgSO}_3$                      | 4) $\text{MgSO}_4$                      |
| B) $\text{MgO} + \text{SO}_3 \rightarrow$           | 2) $\text{MgSO}_3 + \text{H}_2$         | 5) $\text{MgSO}_4 + \text{H}_2$         |
| C) $\text{MgO} + \text{H}_2\text{SO}_3 \rightarrow$ | 3) $\text{MgSO}_3 + \text{H}_2\text{O}$ | 6) $\text{MgSO}_4 + \text{H}_2\text{O}$ |

26. Establish a correspondence between the reactants and the carbon-containing product that is formed during their interaction. Explain the answer based on the properties of organic compounds.

- |                                     |                    |                    |
|-------------------------------------|--------------------|--------------------|
| A) methanoic acid and calcium oxide | 1) calcium acetate | 4) methyl chloride |
| B) methanol and formic acid         | 2) calcium formate | 5) formaldehyde    |
| C) methanol and hydrogen chloride   | 3) methyl formate  |                    |