

**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  
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*N241-10 om 25.10.2022*

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**Evaluation Criteria for Entrance Attendance-Based Testing in Chemistry (Oral Examination)  
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</b>				
1	The structure of the nuclei and electron shells of atoms of chemical elements. Periodic law and structure of the Periodic system. Types of chemical bonds: covalent (polar and non-polar), ionic, hydrogen, metallic.	For a correct solution, 2 points are given, in the case of a wrong solution or its absence, 0 points are given; for a competent explanation of the answer, 3 points are given, in case of an incorrect explanation or its absence, 0 points are given.	5	5
2	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.	For a correct solution, 2 points are given, in the case of a wrong solution or its absence, 0 points are given; for a competent explanation of the answer, 3 points are given, in case of an	5	5

		incorrect explanation or its absence, 0 points are given.		
3	Regularities of the course of inorganic reactions (ionic, redox, hydrolysis and electrolysis).	For a correct solution, 5 points are given, in the case of a wrong solution or its absence, 0 points are given; for a competent explanation of the answer, 5 points are given, in case of an incorrect explanation or its absence, 0 points are given.	10	5
4	A .M. Butlerov's theory of the chemical structure of organic compounds. Isomerism. Homological series. Electronic and spatial structure of molecules. The concept of hybridisation of atomic orbitals. The concept of the mutual influence of atoms in molecules.	For a correct solution, 5 points are given, in the case of a wrong solution or its absence, 0 points are given; for a competent explanation of the answer, 5 points are given, in case of an incorrect explanation or its absence, 0 points are given.	10	5
5	Hydrocarbons: alkanes, cycloalkanes, alkenes, alkynes, dienes, aromatic hydrocarbons (physical and chemical properties, production methods).	For a correct solution, 5 points are given, in the case of a wrong solution or its absence, 0 points are given; for a competent explanation of the answer, 5 points are given, in case of an incorrect explanation or its absence, 0 points are given.	10	5
6	Oxygen- and nitrogen-containing compounds: monohydric and polyhydric alcohols, phenol, aldehydes, ketones, carboxylic acids, ethers and esters, amines, nitro compounds, amino acids	For a correct solution, 5 points are given, in the case of a wrong solution or its absence, 0 points are given; for a competent explanation of the	10	5

	(physical and chemical properties, production methods, biomedical value).	answer, 5 points are given, in case of an incorrect explanation or its absence, 0 points are given.		
<b>Part 2. Advanced level</b>				
7	Methods for producing various classes of inorganic compounds. (a reaction sequence).	For the correct solution, 5 points are given — 1 point for each transformation (5 transformations in total), in the case of an incorrect solution to the stage of the reaction sequence or the absence of a solution, 0 points are given for each reaction; for a competent explanation for each reaction, 1 point is given (5 points in total), in case of an incorrect explanation or its absence, 0 points are given for each reaction.	10	5
8	Methods for producing various classes of organic compounds. (a reaction sequence).	For the correct solution, 5 points are given — 1 point for each transformation (5 transformations in total), in the case of an incorrect solution to the stage of the reaction sequence or the absence of a solution, 0 points are given for each reaction; for a competent explanation for each reaction, 1 point is given (5 points in total), in case of an incorrect	10	5

		explanation or its absence, 0 points are given for each reaction.		
<b>Part 3. Proficiency level</b>				
9	Inorganic chemistry calculation task.	For the correct solution, 15 points are given (5 points for the correct writing of the equations of chemical reactions, formulae of substances and calculation formulae; 5 points for the correct course of the solution; 5 points for correct calculations with obtaining the correct answer), in the case of absence of any answer element, 0 points is given for each element.	15	10
10	Organic chemistry calculation task.	For the correct solution, 15 points are given (5 points for the correct writing of the equations of chemical reactions, formulae of substances and calculation formulae; 5 points for the correct course of the solution; 5 points for correct calculations with obtaining the correct answer), in the case of absence of any answer element, 0 points is given for each element.	15	10

Head of the Department of General and Bioorganic Chemistry

K. N. Semenov

APPROVED:  
Vice-rector for Academic Affairs

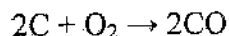
A. I. Yaremenko

### SAMPLE EXAMINATION PAPER

1. The electronic structure is the same for  $\text{Ca}^{+2}$  and  
a)  $\text{K}^+$                       b) Ba                      c) Sr                      d)  $\text{F}^-$ .

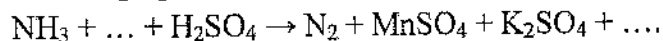
Write the electronic configuration of this ion.

2. How does the rate of a chemical reaction change



when the pressure doubles? Write the kinetic equation for the rate of a forward reaction.

3. Complete the redox reaction and equalise it using the electronic balance method, specify the oxidising agent and the reducing agent.

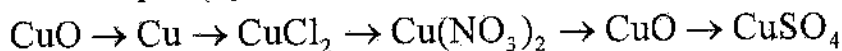


4. Give an example of an organic compound containing a carbon atom  $\text{C}^{+2}$ .

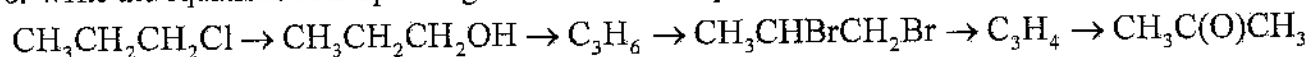
5. Give an example of a benzene halogenation reaction.

6. Write the equation of the qualitative reaction for phenol.

7. Write the equations corresponding to the reaction sequence.



8. Write the equations corresponding to the reaction sequence.



9. Sodium peroxide was treated with hot water. The resulting alkali solution was neutralized with 324 g of a 10% sulfuric acid solution. Determine the mass of peroxide taken.

10. A non-cyclic hydrocarbon weighing 8.4 g can add 3.36 litres of hydrogen. Determine the molecular formula of the compound and propose the structure of the isomers of the given composition.