Chemistry Exam estimation principles for applicants in 2024.

Testing.

The variants of the examination test in chemistry are the same in structure, parallel in the arrangement of tasks: under the same serial number in all variants there is a task that checks the same knowledge.

Chemistry exam consists of two parts.

Part 1 consist of 15 tasks: 8 of them are tasks with multiple choice, 7 are tasks to establish correspondence between a series of questions and answers. The answer should be given as a sequence of digits. Each digit should be written in a separate cell without spaces and other symbols. Sequence of digits in the answer to be aligned with the sequence of proposed answers.

Tasks of Part 1 are estimated from 1 to 4 scores. The maximum total score for Part 1 is 41.

Part 2 contains 5 tasks with expanded answer and is estimated from 2 to 5 scores depending on number of answer elements, the completeness and correctness of the answer. The maximum total score for Part 2 is 19.

Table

Answers Evaluation Criteria

Part 1

Verifiable knowledges	Amount of answers	Maximum score
1. The structure of the electron shells of atoms of elements of the first four periods: s-, p- and d-elements. The electronic configuration of the atom. Ground and excited states of atoms. (Multiple choice)	2	2
2. Laws of the chemical properties of elements and their connections to periods and groups. General characteristics of metals IA – IIIA groups in connection with their position in the Periodic table and structural features of their atoms. (Multiple choice))	3	3
3. Covalent chemical bond, its varieties and formation mechanisms. Characteristics of covalent bonding (polarity and bonding energy). Ion bond. Metal bond. Hydrogen bond. Substances of molecular and non-molecular structure. Type of crystal lattice. The dependence of the properties of substances on their	2	2

composition and structure (Multiple choice)		
4. Classification of inorganic substances. Nomenclature of inorganic substances (trivial and international) (Establishing of correspondence)	3	3
5. Characteristic chemical properties of bases and amphoteric hydroxides. Characteristic chemical properties of an acid. Characteristic chemical properties of salts: medium, acidic, basic; complex (on the example of aluminum and zinc hydroxocompounds). Electrolytic dissociation of electrolytes in aqueous solutions. Strong and important electrolytes. Ion exchange reactions. (multiple choice)	2	2
6. Characteristic chemical properties of inorganic substances: simple substances-metals: alkali, alkaline earth, magnesium, aluminum, transition metals (copper, zinc, chromium, iron); - simple substances-non-metals: hydrogen, halogens, oxygen, sulfur, nitrogen, phosphorus, carbon, silicon; – oxides: basic, amphoteric, acid; – bases and amphoteric hydroxides; – acids; – salts: medium, acidic, basic; complex (on the example of hydroxo compounds of aluminum and zinc) (Establishing of correspondence)	4	4
7. The relationship of inorganic substances (multiple choice)	2	2
8 Classification of organic substances. Nomenclature of organic substances (trivial and international) (Establishing of correspondence)	3	3
9. The theory of the structure of organic compounds: homology and isomerism. The mutual influence of atoms in molecules. Types of bonds in the molecules of organic substances. Hybridization of carbon atomic orbitals. Radical. Functional group (Multiple choice)	2	2
10. Characteristic chemical properties of hydrocarbons: alkanes, cycloalkanes, alkenes, dienes,	2	2

alkynes, aromatic hydrocarbons (benzene and homologues of benzene, styrene). The most important methods for obtaining hydrocarbons. Ionic (V.V. Markovnikov's rule) and radical reaction mechanisms in organic chemistry (Multiple choice)		
11. The characteristic chemical properties of alcohols, phenol, aldehydes, carboxylic acids, esters. The most important methods for producing oxygen-containing organic compounds (Multiple choice)	2	2
12. Interconversion of hydrocarbons, oxygen-containing and nitrogen-containing organic compounds (Establishing of correspondence)	2	2
13. Electrolysis of melts and solutions (salts, alkalis, acids) (Establishing of correspondence)	4	4
14. Hydrolysis of salts. The environment of aqueous solutions: acidic, neutral, alkaline (Establishing of correspondence)	4	4
15. Reversible and irreversible chemical reactions. Chemical equilibrium. Displacement of balance under the influence of various factors (Establishing of correspondence)	4	4
Total	**Part 1**	**41**

Часть 2

№ and topic of question	Expected answer	Maximum score
16. Calculations using the concept of "mass fraction of substances in solution"	Mass fraction is calculated	2
	Sub total	**2**
17. Calculations by thermochemical equations	Amount of heat is calculated	2
	Sub total	**2**
18. Redox reactions	Oxidizing agent is named	1
	Reducing agent is named	1
	Oxidation product is named	2
	The number of electrons is indicated	1
	Sub total	**5**
19. Calculations using the concepts of "solubility", "mass fraction of a substance in solution". Calculations of the mass (volume, amount of	Reaction product is named	1
	The mass (number of moles) of the substance formed or reacted is calculated	1

substance) of the reaction products, if one of the substances is given in excess (has impurities). Calculations of the mass (volume, amount of substance) of the reaction product, if one of the substances is given as a solution with a certain mass fraction of the dissolved substance. Calculations of the mass or volume fraction of the yield of the reaction product from the theoretically possible. Calculations of the mass fraction (mass) of a chemical compound in a mixture	Mass of solution is calculated	2
	Mass fraction is calculated	1
	Sub total	**5**
20. Establishment of a molecular formula and the name of an organic substance, determination of the type of chemical reaction involving this substance	The molar ratio is indicated	3
	Organic substance is named	1
	Type of reaction is named	1
	Sub total	**5**
Total	**Part 2**	**19**

The maximum primary score for the correct completion of all tasks of the examination work is 60. Based on the results of the completion of all tasks of the work, the level of knowledge of applicants is assessed on a 100-point scale.

The exam duration is 1,5 hour (90 minutes).