Chemistry Exam estimation principles

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	Maximum score
	of answers	
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 composition and structure (Multiple	2	2

choice)		
4. Classification of inorganic	3	3
substances. Nomenclature of		
inorganic substances (trivial and		
international)		
(Establishing of correspondence)		
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	4	4
of inorganic substances: simple substances-metals: alkali alkaline		
earth, magnesium, aluminum,		
transition metals (copper, zinc,		
chromium, iron); - simple substances-		
non-metals: hydrogen, halogens,		
carbon, silicon; – oxides: basic,		
amphoteric, acid; – bases and		
amphoteric hydroxides; - acids; -		
salts: medium, acidic, basic; complex		
compounds of aluminum and zinc)		
(Establishing of correspondence)		
7. The relationship of inorganic	2	2
substances		
(multiple choice)	2	2
Nomenclature of organic substances.	3	3
(trivial and international)		
(Establishing of correspondence)		
9. The theory of the structure of	2	2
organic compounds: homology and		
atoms in molecules. Types of bonds in		
the molecules of organic substances.		
Hybridization of carbon atomic		
orbitals. Radical. Functional group		
(Multiple choice)		
10. Characteristic chemical properties	2	2
of hydrocarbons: alkanes,		
alkynes, aromatic hydrocarbons		

		1
(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	2	2
properties of alcohols, phenol,		
aldehydes, carboxylic acids, esters.		
The most important methods for		
producing oxygen-containing organic		
compounds		
(Multiple choice)		
12 Interconversion of hydrocarbons	2	2
oxygen_containing and nitrogen_	2	2
containing organic compounds		
(Establishing of correspondence)		
13 Electrolysis of melts and solutions	1	1
(salte alkalie acide)	+	7
(Establishing of correspondence)		
14 Hydrolysis of salts The	1	1
environment of aqueous solutions:	+	7
acidic neutral alkaline (Establishing		
of correspondence)		
15 Reversible and irreversible	1	1
chemical reactions Chemical	4	+
equilibrium Displacement of balance		
under the influence of various factors		
(Establishing of correspondence)		
Total	Dart 1	/1
1000	1 41 1	71

Часть 2

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

if one of the substances is given in	Mass fraction is calculated	1
excess (has impurities). Calculations	Sub total	5
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		
20. Establishment of a molecular	The molar ratio is indicated	3
formula and the name of an organic	Organic substance is named	1
substance, determination of the type	Type of reaction is named	1
of chemical reaction involving this	Sub total	5
substance		
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 hour (60 minutes).

Part 1 is estimated by computer, Part 2 is checked by members of subject commission.

Chairman of the subject commission in chemistry

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