

**Specification of the test on Chemistry for
Unified National Testing and Complex Testing**

(Approved for use in the Unified National Testing and Complex Testing from 2018)

The document was developed in accordance with the State Educational Standards of secondary education and with educational programs in general subjects.

1. The purpose of the development of the test: Determination of preparedness level of entrants for Chemistry to admit to higher educational institutions of the Republic of Kazakhstan

2. The content of the test: The test consists of 30 test items. There are 3 difficulty levels, which are as follows: test items of the first level-15, the second level-8, the third level-7.

The test includes educational material of Chemistry in accordance with the curriculum for the general education school.

№	Chapter	№	Topic	№	Subtopic
01	General chemistry	01	Common chemical notion	01	Common chemical notion
		02	Periodic system of chemical elements. Periodic law of D.I.Mendeleev. Structure of atom	01	Periodic system of chemical elements. Periodic law of D.I.Mendeleev. Structure of atom
		03	Chemical bond and structure of substances	01	Chemical bond and structure of substances
		04	Regularity of flow chemical reactions	01	Rates of Chemical Reaction
				02	Chemical Equilibrium
		05	Dissociation of electrolytes and solutions	01	Dissociation of electrolytes
				02	Ionic reactions in solutions
				03	Hydrolysis of salts
02	Inorganic chemistry	01	Metals	01	Common properties of metals
				02	Metals of I A (1) group
				03	Metals of II A (2) group
				04	Metals of III A (13) group
				05	Transition's metals
		02	Nonmetals	01	Common properties of nonmetals
				02	Nonmetals of IV A (14) group
				03	Nonmetals of V A (15) group
				04	Nonmetals of VI A (16) group
				05	Nonmetals of VII A (17) group
03	Organic chemistry	01	Classification and nomenclature of organic compounds	01	Classification and nomenclature of organic compounds
				02	Types of chemical reactions in organic chemistry
		02	Hydrocarbons	01	Alkanes. Cycloalkanes
				02	Alkenes. Alkadiens. Alkynes
				03	Aromatic's hydrocarbons
		03	Oxygen-	01	Alcohols and phenols

			containing organic compounds	02	Aldehydes
				03	Carboxylic Acids. Esters. Fats
				04	Carbohydrates
		04	Nitrogen-containing organic compounds	01	Amines and Amino acids
				02	Proteines. Nucleic Acids. Heterocyclic
		05	Polymers. Natural sources of hydrocarbons	01	Polymers. Natural sources of hydrocarbons
04	Stoichiometry (Calculations and Mole Concept) in chemistry	01	General chemistry	01	Calculations in general chemistry
		02	Inorganic chemistry	01	Calculations in inorganic chemistry
		03	Organic chemistry	01	Calculations in organic chemistry
05	Qualitative tasks	01	Qualitative tasks	01	Tasks to application
				02	Tasks to analysis
				03	Tasks to synthesis

3. Characteristics of the content of test items:

By the end of this course of chemistry, entrants will:

know: chemical symbolic and terms: substance, chemical symbols of elements, atom, molecule, chemical formulas of substances, atomic relative mass, formula mass, chemical reactions, structure of atom, protons, neutrons, electrons, electronic orbital, charge of nucleus, ions, isotopes, chemical bond, crystalline lattices, mole, molar mass, molar volume, Avogadro's number, heat effect of reaction, allotrope, catalyst, electronegative, oxidation and reducing agent, oxidation and reduction, oxidation - reduction reaction, oxides, indicators, acids, bases, salts, genetic relation;

2) Fundamental laws: the law of conservation of mass of substances, the law of definite proportions, Mendeleev's periodic law, Avogadro's law;

3) electrolytes, non-electrolytes, electrolytic dissociation, degree of dissociation, qualitative reactions to determine anions and cations, hydrolyses of salts, pH-number, nonmetals, allotrope, metals, metallic bond, metallic lattices, corrosion of metals, electrolyses, alloys, pig iron, steel;

4) Common production processes of substances, modern technologies of industrial synthesis;

5) Classes of inorganic compounds and their genetic relations, increasingly larger role of chemistry to produce of compounds and materials, social advancement and health protection of people and nature; chemical protective device environment from the chemical pollution and organization a healthy lifestyle;

6) Structure of atom and atomic orbital's, conditions of electrons, the Pauli's principle, the Hund's rule, the Clechcovsky's rules, bases of chemical kinetics, mechanism of the reactions, catalyses, heat effect of reaction, heat of formation, chemistry equilibrium, constant of equilibrium, metallurgy industry, electrolyses, quantitative relationship between physical dates;

7) Scientific principles of chemical processes, chemical pollution and their effects;

8) Classification of inorganic compounds, chemical properties of elements and their connections;

9) Principle and types of chemical reactions, independent performance of experiment and mathematical processing of results, corrosion of metals and methods of their protection;

10) Chemical structure, homologous compounds, homologous row. Isomerism, homologous, isomers, structure isomerism and stereoisomerism, the basis contention of theory structure of organic compounds named after A.M.Butlerov and their significance; notion about hybridization and their types, σ and π - bonds, single, double and triple covalent bonds between carbon atoms, types of carbon chains; electron and spatial structure organic compounds; types of reactions in organic chemistry;

11) Natural resources of hydrocarbons, their processing, occurrence in Kazakhstan; classification and nomenclature of organic compounds, functional group; reaction, which describe properties and preparation hydrocarbons and their derivative; genetic relation between hydrocarbons and their derivative;

12) the high molecular weight species, monomer, polymer, elementary unit, degree of polymerization, polymerization and polycondensation; most abundantly used polymers, plastics, fibers, rubbers; scientific principles of chemical industry, chemical pollution of environment and their effects;

By the end of this course chemistry, students **should be able:**

1) **to determine** : valence and oxidation number of atom in compounds; structure of compounds and appliance to the determinate classes of compounds; types of chemical bond in the elements and compounds and their characteristics; crystalline lattices; types of chemical reactions and their characteristics; reaction media in water solutions of substances with different solutions; oxidation and reducing agent, oxidation - reduction reaction; the basis of the data chemical thermodynamics predict the possibility and direction of chemical processes, chemical equilibrium when affected by different factors; composition and structure hydrocarbons, their derivate compounds, include their different classes of organic compounds;

2) **to apply**: formulas of known inorganic substances, genetic rows of substances; formulas of oxides, acids, basis, salts; metals, nonmetals and their compounds; electronic structure of atom, structure of the Periodic Table of chemical elements; chemical equations for metals and nonmetals, their properties and compounds; ionic equations of electrolytic dissociation; structure formulas of organic substances;

3) **to explain**: what is amphoteric behavior of substances, allotropy; the location metals and nonmetals in the Periodic Table of chemical elements; to predict properties of chemical elements using location in the Periodic Table of chemical elements, structure their atoms, chemical properties of the concrete examples of oxides, acids, basis and salts; the general principles of the Periodic Table of chemical elements named after Mendeleev, periodic properties of basis-acidic and oxidation-reducing properties which bases on knowledge of structure of atoms; presence, mechanism and general principles theory of electrolytic dissociation; to dependence chemical rates from different factors; chemical properties of organic substances, their behavior from mutual interference atoms and molecules;

4) **to apply**: skills of calculation of problems: volume of gases, amount of a substance, Avogadro's number, molar volume of gases, mass of solution, weight percent of solute substances in solution, volumetric ratio of gases in chemical reactions; to calculate up mass or volume of substances according different amount of a substance, mass or volume substances to participate in something in the chemical reactions, heat effects of chemical reaction; calculation tasks to depend molecular formula of substances, using date of quantitative analyses and mass of products of burning;

5) **to calculate**; according to chemical formulas relative molecular mass of substances; weight percent of chemical elements in the compounds; weight percent in solutions; using chemical equations to find amount of a substance, mass of a substance, volume of gas; according to amount of a substance one of the substances or products of the reaction; mass of water, mass of solute according to known mass of solution with determinate weight percent of solute; weight percent and volume percent of possible in theory mass unit substances in the mixture; molecular formula gases substances according to relative density; to find the molecular formula of substances according to date of quantitative analyses and mass of products of burning;

4. Forms of test items:

The test consists of 20 test items with the choice of one correct answer from 5 proposed and 10 test items with one or more correct answers from multiple choices.

5. Assessment of the test item and the whole test:

The correctly done test item with the choice of one correct answer is given one point, incorrectly done no (zero) points.

In the test items with one or more correct answers (up to three correct answers):

- if there is only one correct answer and if a test-taker chooses the correct answer, he/she gets two points;
- if there is only one correct answer and if a test-taker chooses the correct answer and one incorrect answer, he/she gets one point;
- if there is only one correct answer and if a test-taker chooses two or more incorrect answers, he/she gets no (zero) points;
- if there are two correct answers and if a test-taker chooses two correct answers, he/she gets two points;
- if there are two correct answers and if a test-taker chooses one correct answer, he / she gets one point;
- if there are two correct answers and if a test-taker chooses one correct and one incorrect answer, he/she gets one point;
- if there are two correct answers and if a test-taker chooses both correct answers and one incorrect answer, he/she gets one point;
- if there are two correct answers and if a test-taker chooses two or more incorrect answers, he/she gets no (zero) points;
- if there are three correct answers and if a test-taker chooses all three correct answers, he/she gets two points;
- if there are three correct answers and if a test-taker chooses two correct answers, he/she gets one point;
- if there are three correct answers and if a test-taker chooses two correct answers and one incorrect answer, he/she gets one point;
- if there are three correct answers and if a test-taker chooses three correct answers and one incorrect answer, he/she gets one point;
- if there are three correct answers and if a test-taker chooses one correct answer or two and more incorrect answers, he/she gets no (zero) points.

If a test-taker answers the whole test correctly, he / she gets 40 points.