

SYLLABUS
of entrance examination in Chemistry
for the specialty "Medicine"

I. BASIC AND INORGANIC CHEMISTRY

1. Structure of the atom. Atomic nucleus, isotopes and isobars. Basic characteristics of the electron: atomic orbital, state of the electron in the atom, quantum numbers. Grouping atomic orbitals based on quantum numbers. Basic rules for filling atomic orbitals with electrons. Representation of the electronic configurations of chemical element atoms. Basic and excited state of the atom.

2. Periodic law and periodic table of chemical elements. Periodic law and structure of the periodic table. Regularities in the construction of periods and groups. Characterization of chemical elements by periods and groups. Atomic properties: atomic and ionic radius, ionization energy, electron affinity, electronegativity.

3. Chemical bond. Nature of the covalent bond. Types of bonds: non-polar and polar covalent bond; σ - and π -bonds; localized and delocalized connection; metal connection; donor-acceptor bond. Characteristics of the covalent bond: saturation, multiplicity, polarity and polarizability, length, strength (energy) of the bond, directionality of the covalent bond. Hybridization involving s- and p-atomic orbitals. Spatial structure of molecules - polar and non-polar molecules. Intermolecular interactions. Hydrogen bond - essence, types, meaning. Ionic bond and ionic compounds. Valence and oxidation state.

4. Chemical elements. General characteristic, structure of the atoms and chemical nature of chemical elements. Interactions with hydrogen, oxygen, metals/non-metals, acids, bases and salts.

5. Chemical compounds. Oxides, hydroxides, oxoacids, salts - composition, structure, types, physical and chemical properties.

6. Thermochemistry. Nature of the thermochemistry. Thermal effects of chemical reactions. Laws of the thermochemistry. Application of Hess's law and its consequences to the calculation of thermal effects.

7. Speed of the chemical processes. Chemical kinetics. Definition of rate of chemical reactions and ways of its expression. Dependence of the speed on concentration, law of mass action. Mechanism of chemical reactions. Dependence of the rate of chemical reactions on temperature, activation energy, energy diagrams. Arrhenius equation.

8. Catalysis. Essence and basic concepts. Types of catalysis. Mechanism of catalytic action in homogeneous and heterogeneous catalysis. Enzyme catalysis

9. Chemical equilibrium. Reversibility of chemical reactions. Nature and features of the chemical equilibrium. Equilibrium constant. Factors that affect the chemical equilibrium – influence of concentration and total pressure on chemical equilibrium. Effect of temperature on the equilibrium constant. Principle of mobile equilibrium.

10. Solutions. Dispersion systems – definition, basic concepts, classification. True solutions. Nature of the dissolution, solubility and factors on which the solubility depends. General properties of the solutions: vapour pressure; variation of the boiling and freezing temperatures of the solutions. Diffusion, osmosis and osmotic pressure.

11. Colloid-dispersive systems. General characterization and derivation of colloid-dispersive systems. Structure of the colloidal particles of lyophobic colloids – examples. Properties of colloid-dispersive systems – kinetic, optical, electric. Stability of lyophilic and lyophobic colloids, coagulation and peptization.

12. Oxidation-reduction processes. Characteristics of the oxidation-reduction processes, oxidation and reduction, oxidizer and reducer. Equalization of the equations of the oxidation-reduction processes. Oxidation-reduction processes in electrolyte solutions. Order of the relative activity of the metals. Electrolytic processes: definition, electrolysis of molten salts, electrolysis of aqueous solutions of salts.

13. Theory of the electrolyte dissociation. Electrolytes and nonelectrolytes. Mechanism of the electrolytic dissociation in substances with ionic structure and with polar molecules. Degree of electrolytic dissociation. Strong and weak electrolytes. Factors on which the degree of electrolyte dissociation depends. Dissociation constant.

14. Acids, bases and salts. Acids, bases and salts from the point of view of the theory of electrolytic dissociation. Brønsted and Lowry's theory of acids and bases. Water dissociation. Hydrogen indicator. Ion exchange reactions. Hydrolysis of salts: characteristic and factors that influence hydrolysis processes.

II. ORGANIC CHEMISTRY

15. Composition and structure of organic compounds. Carbon chains and structural formulas. Construction and hybridization of the carbon atom. Basics of the theory of the structure of organic compounds. Isomerism — structural and spatial.

16. Alkanes. Homologous order, names, isomerism, structure, physical and chemical properties. Preparation.

17. Alkenes. Homologous order, names, isomerism, structure, physical and chemical properties. Preparation.

18. Alkynes. Homologous order, names, isomerism, structure, physical and chemical properties. Preparation.

19. Arenes. Benzene - structure, physical and chemical properties. Benzene homologues, isomerism, physical and chemical properties. Preparation of benzene and benzene homologues.

20. Hydroxyl derivatives of hydrocarbons. Alcohols and phenols - classification, names, isomerism. Structure, physical and chemical properties of alcohols and phenols. Preparation.

21. Carbonyl derivatives of hydrocarbons - aldehydes and ketones. Classification, names, isomerism. Structure, physical and chemical properties of aldehydes and ketones. Preparation.

22. Carboxylic acids. Classification and names. Homologous order of fatty saturated monocarboxylic acids. Isomerism, structure, physical properties, chemical properties and preparation of fatty and aromatic carboxylic acids. Functional derivatives of carboxylic acids - acid halides, anhydrides, esters, amides. Fats - structure and properties.

23. Amines. Types, names, structure, physical and chemical properties. Preparation.

24. Amino acids. Composition and structure, types, names, isomerism, physical and chemical properties. Peptides – preparation and properties.

25. Carbohydrates. General classification. Monosaccharides – structure and properties of glucose and fructose. Disaccharides – structure and properties of sucrose. Polysaccharides – structure and properties of starch and cellulose.

Textbooks for preparation

For their preparation, the applicants can use the following textbooks and teaching aids for compulsory preparation (CP) and profiled preparation (PP), published until 2016 by the publishers "Prosveta-Sofia", "Bulvest-2000" and "Anubis":

Grade 8:

1. Chemistry and environmental protection for 8th grade, L. Bojanova *et al.* 2003 and stereotyped editions, Ed. "Prosveta-Sofia".

Grade 9:

2. Chemistry and environmental protection – CP and PP, G. Bliznakov *et al.* 2001-2013, Ed. "Anubis".
3. Chemistry and environmental protection – CP and PP, M. Kirilov *et al.* 2002-2013, Ed. "Bulvest-2000".
4. Chemistry and environmental protection – CP and PP, St. Manev *et al.* 2002-2013, Ed. "Prosveta-Sofia".

Grade 10:

5. Chemistry and environmental protection – CP and PP, G. Bliznakov *et al.* 2001-2013, Ed. "Anubis".
6. Chemistry and environmental protection – CP and PP, G. Neikov *et al.* 2002-2013, Ed. "Bulvest-2000".
7. Chemistry and environmental protection – CP and PP, St. Manev *et al.* 2002-2013, Ed. "Prosveta-Sofia".

as well as the textbooks and teaching aids issued and approved by the Ministry of Education in the period 2017-2020 (CP and PP):

Compulsory preparation

Grade 8:

1. Chemistry and environmental protection – Stefan Tsakovski, Penka Vassileva, Alexandria Gendjova, Boris Tolev, Galya Shumanova; Ed. "KLET BULGARIA" Ltd.
2. Chemistry and Environmental Protection - Svoboda Beneva, Marko Kostadinov, Dancho Danalev, Lilia Ovcharova, Margarita Yotova; Ed. "KLET BULGARIA" Ltd.
3. Chemistry and Environmental Protection – Mitka Pavlova, Milena Kirova, Elena Boyadzhieva, Nevena Varbanova, Valentina Ivanova, Alexander Krastev; Ed. SD "Pedagogue 6" – Delev, Luizova *et al.*
4. Chemistry and Environmental Protection – Lilyana Boyanova, Krasimir Nikolov, Ivaylo Ushagelov, Emilia Todorova; Ed. "Prosveta Plus" Ltd.
5. Chemistry and Environmental Protection – Stefan Manev, Kiril Atanasov, Lyudmila Mihova; Ed. "Prosveta – Sofia" AD
6. Chemistry and Environmental Protection - Harrieta Dimitrova, Jim Clark; Ed. SANPRO

Grade 9:

7. Chemistry and Environmental Protection – Stefan Tsakovski, Alexandria Gendjova, Rositsa Nikolova, Nevyanka Encheva, Boris Tolev, Magdalena Docheva; Ed. "KLET BULGARIA" Ltd.
8. Chemistry and Environmental Protection – Dancho Danalev, Lilia Ovcharova-Kirilova, Marko Kostadinov, Svoboda Beneva; Ed. "KLET BULGARIA" Ltd.
9. Chemistry and Environmental Protection – Mitka Pavlova, Milena Kirova, Elena Boyadzhieva, Nevena Varbanova, Valentina Ivanova; Ed. SD "Pedagogue 6" – Delev, Luizova *et al.*
10. Chemistry and Environmental Protection – Lilyana Boyanova, Krasimir Nikolov, Ivaylo Ushagelov, Emilia Todorova; Ed. "Prosveta Plus" Ltd.
11. Chemistry and Environmental Protection – Donka Tasheva, Kiril Atanasov, Stefan Manev, Lyudmila Mihova; Ed. "Prosveta – Sofia" AD
12. Chemistry and Environmental Protection – Harrieta Dimitrova, Violeta Konstantinova; Ed. SANPRO

Grade 10:

13. Chemistry and Environmental Protection – Stefan Tsakovski, Alexandria Genchova, Penka Vasileva, Boris Tolev, Magdalena Docheva, Kiril Atanasov; Ed. "KLET BULGARIA" Ltd.
14. Chemistry and Environmental Protection – Boryana Donkova, Vasil Delchev, Iliya Manolov, Yordanka Stefanova, Galya Shumanova, Kamelia Savova, Tatyana Ghiuseleva; Ed. "KLET BULGARIA" Ltd.
15. Chemistry and Environmental Protection – Mitka Pavlova, Milena Kirova, Elena Boyadzhieva, Nevena Varbanova, Valentina Ivanova, Irina Andonova, Vesselina Rangelova; Ed. SD "Pedagogue 6" – Delev, Luizova *et al.*
16. Chemistry and Environmental Protection – Lilyana Boyanova, Krasimir Nikolov, Emilia Todorova, Ivaylo Ushagelov; Ed. "Prosveta – Sofia" AD
17. Chemistry and Environmental Protection – Svoboda Beneva, Margarita Yotova, Lilia Ovcharova-Kirilova, Dancho Danalev, Marko Kostadinov, Ivaylo Traykov; Ed. „Regalia 6" Ltd.
18. Chemistry and Environmental Protection – Violeta Konstantinova, Harrieta Dimitrova, Daniela Manoilova; Ed. SANPRO

Profiled preparation:

Grade 11:

1. Chemistry and Environmental Protection, Module 2 – Kiril Gavazov, Petya Racheva, Yordanka Stefanova, Galya Shumanova, Tatyana Ghiuseleva; Ed. „KLET BULGARIA" Ltd.

2. Chemistry and Environmental Protection, Module 1 – Nevena Varbanova, Lyudmila Mihova, Ivaylo Ushagelov, Nelly Dyankova, Nasko Stamenov, Malinka Shopova, Maria Nikolova; Ed. SD "Pedagogue 6" – Delev, Luizova *et al.*
3. Chemistry and Environmental Protection, Module 2 – Nevena Varbanova, Lyudmila Mihova, Ivaylo Ushagelov, Nelly Dyankova, Nasko Stamenov, Malinka Shopova, Maria Nikolova, Micha Karavasteva; Ed. SD "Pedagogue 6" – Delev, Luizova *et al.*
4. Chemistry and Environmental Protection, Module 1 – Lilyana Boyanova, Krasimir Nikolov, Kalinka Benova, Antoaneta Hineva; Ed. „Prosveta-Sofia" AD
5. Chemistry and Environmental Protection, Module 2 – Lilyana Boyanova, Krasimir Nikolov, Kalinka Benova, Daniela Manoilova, Antoaneta Hineva; Ed. „Prosveta-Sofia”.