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Topics and Questions for an Entrance Comprehensive Examination on the "Chemistry"

1. CHEMISTRY: GENERAL ISSUES

The subject of chemistry. Role and tasks of chemistry.
Basic concepts and laws of chemistry. Atomic-molecular doctrine. Symbolism of chemistry. Basic stoichiometric laws. Stoichiometric calculations. Ideal gases and their mixtures. Gas laws and calculations with their use.
Structure of the substance. Structure of atomic nuclei and electron shells of atoms. D.I. Mendeleev's periodic law and periodic system of chemical elements. Basics of the theory of chemical bonding.
Solutions. Basics of the theory about solutions. Calculations using concentrations of solutions. The theory of electrolytic dissociation.
Regularities of chemical reactions. Classification of chemical reactions. Compiling equations of chemical reactions. Basics of thermochemistry. Thermochemical calculations. Chemical equilibrium. The theory about the rate of chemical reactions and catalysis. Chemical reactions in electrolyte solutions. Chemistry and electric current.

2. BASICS OF INORGANIC CHEMISTRY

Classification of inorganic substances. General overview of simple substances. General methods for obtaining complex substances of different classes and their main chemical properties.
Chemistry of non-metals. Hydrogen, oxygen, elements of fluorine, sulphur, nitrogen and carbon subgroups. Obtaining, structure, properties and application of the most important simple and complex substances formed from these elements.
Chemistry of metals. Alkaline and alkali-earth metals. Aluminium. Some representatives of transition elements: chromium, manganese, iron, copper, zinc. Obtaining, structure, properties and application of simple and complex substances formed from these elements.

3. BASICS OF ORGANIC CHEMISTRY

Theoretical foundations of organic chemistry. Theory of chemical structure. Electronic structure of organic compounds. Intermediate particles in reactions

involving organic compounds. Classification of reagents and reactions with participation of organic compounds. Classification of organic compounds.
Chemistry of hydrocarbons and their derivatives. Saturated hydrocarbons, ethylene, diene, acetylene and aromatic hydrocarbons. Halogen derivatives of hydrocarbons. Alcohols and phenols. Aldehydes. Carboxylic acids and their derivatives. Nitrogen-containing compounds. Organic compounds with several functional groups. Obtaining, structure, properties and application of organic substances of these classes.
General concepts of high-molecular compounds.
Main strategies of organic synthesis.

4. APPLIED SECTIONS OF CHEMISTRY

Basics of chemical technology. Production of the most important inorganic substances. General overview of metallurgical processes. Mineral fertilizers. Natural sources of organic compounds and their processing. Industrial synthesis of the most important organic substances.
Basics of qualitative analysis of substances.
Chemistry and the environment. Water hardness. Corrosion of metals.