

Chemistry

Topics covered:

The composition of matter

States of matter; heterogeneous and homogeneous systems; compounds and elements. Ideal Gas Laws.

Atomic structure

Elementary particles; atomic number and mass number, isotopes, electronic structure of atoms of different elements.

The periodic table of the elements

Groups and periods; transition elements. Periodic properties of elements: atomic radius, ionization potential, electron affinity, metallic character. The relationships between electronic structure, position in the periodic table, and element properties.

The chemical bond

Ionic, covalent and metallic bonds. Binding energy. Polarity of bonds. Electronegativity. Intermolecular bonds.

Fundamentals of inorganic chemistry

Nomenclature and main properties of inorganic compounds: oxides, hydroxides, acids, salts.

Chemical reactions and stoichiometry

Atomic and molecular mass, Avogadro's number, mole concept and its application, elementary stoichiometric calculations, balancing simple reactions, different types of chemical reaction.

Solutions

Solvent properties of water, solubility, the main ways of expressing the concentration of solutions. Equilibria in aqueous solution. Chemical kinetics and catalysis.

Oxidation and reduction

Oxidation number, concept of oxidizing and reducing. Balancing of simple reactions.

Acids and bases

The concept of acid and base. Acidity, neutrality and basicity of aqueous solutions. The pH scale. Hydrolysis. Buffer solutions.

Fundamentals of organic chemistry

Bonds between carbon atoms, and crude formulas of structure, the concept of isomerism. Aliphatic, alicyclic and aromatic hydrocarbons. Functional groups: alcohols, ethers, amines, aldehydes, ketones, carboxylic acids, esters, amides. Chemical nomenclature.