

Chemistry

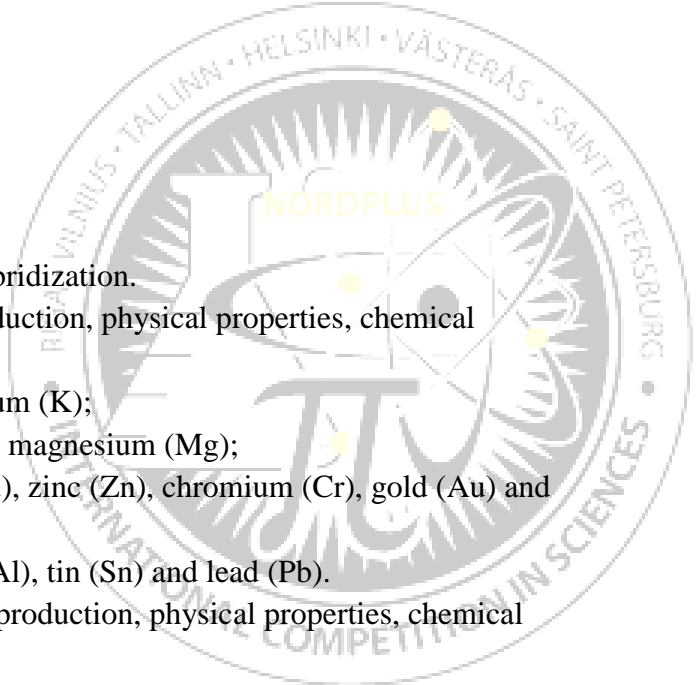


Form 10 – General chemistry

1. Chemical reactivity
 - a. Chemical equations;
 - b. Reactions of inorganic salts, oxides, bases and acids; reaction chains;
 - c. Oxidation reactions – burning materials;
 - d. Chemistry of hydrogen;
 - e. Formation of acid rain and greenhouse effect;
 - f. Reactions between ions in solution;
 - g. Exothermic and endothermic reactions, heat of reaction.
2. Quantitative relations in chemistry
 - a. The mole concept and Avogadro's constant;
 - b. Mass and gaseous volume relationships in chemical reactions, ideal gas law;
 - c. Solutions (mass fraction, molar concentration, mass concentration);
 - d. Chemical formulas, calculation of formulas from element analysis.
3. Atomic structure and periodic table
 - a. Structure of atom;
 - b. Electron arrangement;
 - c. The periodic table;
 - d. Characterization of atom from periodic table;
 - e. Determination of physical properties using periodic table;
 - f. Radioactive decay, chemical equations.
4. Bonding and structure
 - a. Ionic bonding;
 - b. Covalent bonding;
 - c. Intermolecular forces;
 - d. Metallic bonding;
 - e. Relationship between bonding and physical properties.

Form 11 – Chemistry of elements

5. Acids and bases
 - a. Properties of acids and bases;
 - b. Strong and weak acids and bases;
 - c. The pH scale, calculation of pH of monoprotic acid or base solution ($\text{pH} = -\log C$);
 - d. Reactions of inorganic salts, oxides, bases and acids; reaction chains;
 - e. Titration and calculations using results of titration, mass fraction, molar concentration, mass concentration.
6. Oxidation and reduction
 - a. Oxidation numbers;
 - b. Introduction to oxidation and reduction reactions, identification of these reactions;

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- c. Redox equations;
 - d. Electrolysis;
 - e. Electron arrangement in atoms and ions;
 - f. Shapes of binary molecules and ions, hybridization.
7. Chemistry of metals – occurrence in nature, production, physical properties, chemical properties, main compounds.
- a. Alkali metals – sodium (Na) and potassium (K);
 - b. Alkaline earth metals – calcium (Ca) and magnesium (Mg);
 - c. Transition metals – iron (Fe), copper (Cu), zinc (Zn), chromium (Cr), gold (Au) and silver (Ag);
 - d. P group metallic elements – aluminum (Al), tin (Sn) and lead (Pb).
8. Chemistry of nonmetals – occurrence in nature, production, physical properties, chemical properties, main compounds.
- a. Oxygen (O);
 - b. Hydrogen (H);
 - c. Nitrogen (N);
 - d. Sulphur (S);
 - e. Chlorine (Cl);
 - f. Noble gases.
9. Industrial applications of chemistry
- a. Water hardness and its reduction;
 - b. Production of oxygen;
 - c. Production of chlorine, sodium hydroxide, sodium;
 - d. Production of steel, stainless steel.

Form 12 – Organic chemistry

10. Chemistry of carbon
- a. Inorganic compounds of carbon – CO, CO₂, H₂CO₃, carbonates and hydrogen carbonates;
 - b. Allotropy – carbon, diamond, fullerene. Physical and chemical properties of carbon allotropes. Crystal structures.
 - c. Carbon occurrence in nature, production, use in industry.
11. Introduction to organic chemistry
- a. Empirical, molecular and structural formulas, calculation of formulas from element analysis data and chemical reactions;
 - b. Homologous series, change of physical properties;
 - c. Isomerism (up to seven carbon organic compounds);
 - d. IUPAC rules of naming organic compounds (names of all organic compounds will be given according to IUPAC rules);
 - e. Identification of functional groups and organic compound classes: alkanes, alkenes, cycloalkanes, alkynes, arenes, alcohols, aldehydes, ketones, carboxylic acids, amines, halogenoalkanes.

- f. Relationship between structural properties and physical properties (boiling points, solubility in water).
12. Properties of organic compounds – production, physical properties, chemical reactivity (without mechanisms) and reaction pathways, use of compounds.
- Alkanes up to six carbon atoms in molecule;
 - Alkenes up to four carbon atoms in molecule;
 - Alkynes up to three carbon atoms in molecule;
 - Benzene and toluene (methylbenzene);
 - Chloroalkanes up to four carbon atoms in molecule;
 - Alcohols up to four carbon atoms in molecule.

