



Chemistry

Year 9

(68 hrs, 2 hrs per week)

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1.	<p>Solutions</p> <p>Concept of disperse systems. Colloid and molecular solutions. Suspensions, emulsions, and aerosols.</p> <p>Water molecule structure. Water solubility. Solutions. Solution as a physical-chemical process. Concept of crystalline hydrates.</p> <p>Electrolytic dissociation. Electrolytes and non-electrolytes. Electrolytic dissociation of acids, bases, and salts in water solutions. Degree of electrolytic dissociation. Strong and weak electrolytes.</p> <p>Concept of pH solution (without mathematic calculations). PH as a feature of acid or alkali media. Exchange between the solutions of electrolytes, and conditions of its fulfillment. Ion and molecular equations of chemical reactions.</p> <p>Revealing hydroxide ions and hydrogen ions in a solution. Quality reactions on certain ions. Applying quality reactions.</p>
2	<p>Chemical reactions</p> <p>Classification of chemical reactions.</p> <p>Degree of oxidation. Defining the degree of element oxidation using the chemical formula of a compound. Making up a compound formula using the known degrees of elements oxidation.</p> <p>Oxidation-reduction reactions. Making up equations of oxidation-reduction reactions.</p> <p>The meaning of oxidation-reduction reactions in the life of a person, the nature, and machines.</p> <p>Isothermic and endothermic reactions. Thermochemical equation.</p> <p>Reversible and non-reversible reactions.</p> <p>Speed of a chemical reaction</p>
3.	<p>Initial concept of organic compounds</p> <p>Features of organic compounds (compared to non-organic ones).</p> <p>Hydrocarbons.</p> <p>Methane. Methane homologs (first ten of them), their molecular and structural formulas and names. Physical features. Substitution reaction for methane.</p> <p>Ethene (ethylene) and ethine (acetylene).</p> <p>Molecular and structural formulas. Physical features. Halogenation and hydrogenating.</p> <p>Hydrocarbons burning.</p> <p>Concept of polymers at the example of polyethylene. Use of polyethylene.</p> <p>Spreading of hydrocarbons in nature. Oil refining. Hydrocarbon raw materials and environmental protection. Using hydrocarbons.</p> <p>Oxygen-containing organic substances.</p> <p>Concept of alcohols, carbon acids, oils, and hydrocarbons.</p>



	<p>Methanol, ethanol, and glycerol: formulas and physical features. Ethanol burning. Glycerol qualitative test.</p> <p>Toxicity of methanol and ethanol. Harmful effect of alcohol on human organism.</p> <p>Ethanoic (acetic) acid, its molecular and structural formulas, and physical features. Chemical features of ethanoic acid and its use. Higher carboxylic acids. Soap, its ingredients, and washing action.</p> <p>Oils. Oil ingredients and physical features. Natural and hydrogenated oils. Biological role of oils.</p> <p>Carbohydrates: glucose, sucrose, starch, and cellulose. Molecular formulas, physical features, spreading, and natural formation. Starch, and cellulose. Use of carbohydrates, and their biological role.</p> <p>Nitrogen-containing organic substances.</p> <p>Aminoacids. Proteins. Denaturation of proteins.</p> <p>Environmental protection against persistent organic pollutants.</p>
4.	<p>Role of chemistry in the life of a society</p> <p>Diversity of substances and chemical reactions. Interrelations between substances and their mutual transformations. Role of chemistry for maintaining a sustainable development of humanity.</p> <p>Chemical science and production in Ukraine.</p>

Expected results

Pupil:

- **explains** the impact of various factors on solubility of substances; creation of hydrogen bond; and the sense of electrolytic dissociation.
- **distinguishes** between the components of a solution, saturated and unsaturated solutions, cations and anions, electrolytes and non-electrolytes, strong and weak electrolytes; and pH of alkali, acid, and neutral media;
- **solves** experimental tasks by selecting and justifying the means of solution.
- **calculates** the weight, volume, and quantity of substance using the reaction equation with solutions with a certain mass fraction of a dissolved substance by selecting and justifying the means of solution;
- **uses** pH for the features of acid or alkali media;
- **defines** the degree of oxidation of elements in solutions using their formulas;
- **differentiates** between the reactions of combining, replacing, exchanging, and decomposition; oxidation-reduction reactions; exo- and endothermic, reversible and non-reversible reactions; oxidizers and reducers; valency and degree of oxidation of an element;
- **makes up** chemical formulas of binary combinations by the degrees of substance oxidation; equations of the simplest oxidation-reduction reaction based on electron balance; thermochemical equations; equations of reversible and irreversible reactions;
- **classifies** reactions by different features;



- **characterizes** the processes of oxidation, reduction, combining, decomposition, replacing and exchange; the impact of different factors on the speed of chemical reactions; and role of oxidation-reduction for the environment;
- **names** the organogen elements, the most important organic substances, and main petroleum-derived products;
- **explains** the reaction of burning of chemical substances; reactions of substitution of methane, reactions of combining for ethene and ethine; some chemical features of ethanic acid; and sense of oil refining
- **distinguishes** between methane, ethene, ethine, methanol, ethanol, glycerol, ethanic acid, higher carboxylic acids, glucose, sucrose, starch, and cellulose, soap; natural and hydrogenated, animal and vegetable, solid and fluid oils, proteins, polyethylene, and natural and artificial fats;
- **compares:** organic and inorganic substances, starch and cellulose, composition of methane homologs, and saturated and unsaturated hydrocarbons;
- experimentally **defines** glycerol, ethanic acid, glucose, and starch;
- **solves** calculation tasks on the voluminal ratio of gases using chemical equations and other previously learned types of substances using the example of organic compounds;
- **characterizes:** the role of chemistry in the life of the society, the preservation of environment, and human health.
- **adheres** to the rules of use of household chemical agents.