



CHAPTER	LESSON	DESCRIPTION
I. States of Matter	Basic Properties of Matter	At the end of this activity, students should be able to: explain what matter is and describe its structure, specify the state of matter for various substances, define density, measure or calculate the volume of solids and liquids, calculate the density of a substance given its mass and volume, name the basic properties of solids, liquids and gases and discuss the differences between them.
	Gases	At the end of this activity, students should be able to: describe the structure of gases – name the characteristic properties of gases and describe them using the concept of particles (occupying a space of any shape, mixing, compressibility, expansibility, pressure) – explain what influences the pressure of a gas – describe the relationship between the size of gas particles and the density of the gas.
	Liquids	At the end of this activity, students should be able to: represent the structure of liquids and describe their characteristic properties using the particle concept – explain the importance of the ability of liquids to change shape – explain the purpose of a hydrometer – calculate the density of a liquid after measuring its volume and mass.
	Solids	At the end of this activity, students should be able to: illustrate the structure of solids and describe their characteristic properties using the concept of particles – determine the hardness of a solid body on the basis of its behaviour in relation to Mohs' hardness scale for minerals – describe the differences in the structure of matter in its different physical states (distance between particles, forces of attraction, energy of particles, mobility of particles).
	Changes of State	At the end of this activity, students should be able to: give definitions of individual changes of state and the temperatures at which they occur – describe the progress of a change of state using the concept of particles – give examples of changes of state that occur in nature and in everyday life.
	Physical Changes Accompanying Heating and Cooling	At the End of This Activity, Students Should Be Able to: draw the heating curve and cooling curve for a substance and describe them in detail – show the changes in volume and density undergone by most substances during heating or cooling – explain the concept of thermal expansion of bodies and what causes it – describe the changes in the volume and density of water in the three basic states of matter, and explain why ice has a lower density than liquid water – give examples of how the knowledge of thermal expansion of bodies is applied.
	Diffusion and Dissolving	At the end of this activity, students should be able to: describe the phenomenon of diffusion – demonstrate the process of diffusion between substances in different states of matter – name the factors that affect the rate of diffusion and explain the relationship between them – indicate examples of diffusion in the immediate surroundings – describe the process of dissolution and define the terms solvent, solute and solution – name the factors that affect the process of dissolution and describe their effect.
	Gas Laws. Part I	At the end of this activity, students should be able to: name the units used to express gas temperatures and pressures – discuss the relationship between the pressure, temperature and volume of gas – quote Boyle's law and Charles's law – solve calculation problems requiring a knowledge of the gas laws: Boyle's law and Charles's law.
	Gas Laws. Part II	At the end of this activity, students should be able to: discuss the relationship between the volume of a gas and its temperature – quote Gay-Lussac's law – do calculations requiring the application of Gay-Lussac's law – define isobaric, isochoric and isothermal changes and name the gas laws that govern these changes – write the equation describing the relationship among pressure, volume and temperature of a gas – transform the equation of state according to the problem to be solved.



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II. Elements, Compounds and Mixtures	Elements	At the end of this activity, students should be able to: discuss the different types of matter – explain the difference between a pure substance and a mixture – discuss the different types of pure substance – write the symbols of the most important elements – discuss the properties of metals and nonmetals – name the properties of metals that make them different from nonmetals – the properties of metalloids.
	Chemical Compounds	At the end of this activity, students should be able to: define a chemical compound – define a molecule – define a molecular formula – indicate the difference between a molecular formula and an empirical formula – determine the empirical formula based on the percentage composition of a compound – demonstrate, using an example, that the properties of a chemical compound are different from those of the elements that compose it.
	Mixtures	At the end of this activity, students should be able to: discuss the different types of mixture – establish whether a mixture is homogeneous or heterogeneous – define a solution – say what decantation and sedimentation involve – say what centrifugation and evaporation involve – say what crystallisation involves – say what chromatography involves – discuss the uses of chromatography.
III. Atomic Structure	Early Atomic Theories	At the end of this activity, students should be able to: give the main postulates of Dalton's atomic theory – discuss the atomic model proposed by Dalton – discuss the atomic model proposed by Thomson – discuss and interpret the experiment using gold foil – discuss the Rutherford model of the atom – discuss the component particles of the atom (electron, proton, neutron).
	The Structure of the Atom	At the end of this activity, students should be able to: say what information can be obtained from the atomic number – determine the number of protons and the total number of electrons in an atom on the basis of the atomic number – determine the composition of atomic nuclei, given the atomic number and the mass number – explain the term isotope – discuss the similarities and differences between hydrogen isotopes – calculate the percentage abundance of a given isotope.
	Relative Atomic Mass	At the end of this activity, students should be able to: give a definition of atomic mass unit – explain the terms atomic mass and molecular mass – find atomic masses of elements in the periodic table – calculate the atomic mass of an element taking into account its isotopic composition – calculate the isotopic composition of an element on the basis of its atomic mass – explain why it is useful to know the atomic masses of elements.
	Continuous and Line Spectra	At the end of this activity, students should be able to: explain the phenomenon of light – describe and interpret an experiment involving the passing of white light through a prism – discuss the electromagnetic spectrum – describe the atomic spectrum of hydrogen – describe atomic spectra of other elements – discuss the application of flame tests.
	The Bohr Model of the Atom	At the end of this activity, students should be able to: discuss the Bohr model of the atom – define atomic energy levels – discuss the ground state and excited states of the hydrogen atom – explain the formation of the spectral lines in the atomic spectrum of hydrogen – discuss the process of ionization.
	The Electron Configuration of an Atom	At the end of this activity, students should be able to: state the arrangement of electrons in the individual subshells of an atom – write the electron configuration of an atom, knowing its atomic number – give the principles of the classification of elements in the periodic table – determine which group and period a given element belongs to on the basis of its electron configuration – determine the electron configuration of an element knowing its position in the periodic table – describe the formation of positive and negative ions.



CHAPTER	LESSON	DESCRIPTION
IV. Bonding	Ionic Bonding. Part I	At the end of this activity, students should be able to: explain how ionic compounds are formed using the example of sodium chloride – describe the structure of sodium chloride in the solid state – compare the properties of sodium, chlorine and sodium chloride – solve simple problems concerning ionic bond formation.
	Ionic Bonding. Part II	At the end of this activity, students should be able to: discuss the nature of ionic bonds – predict the type of ion formed by Group 1 and 2 metals and the more important Group 16 and 17 nonmetals – describe the structure of an ionic crystal lattice – name the characteristic properties of ionic compounds and explain how they arise.
	Covalent Bonding. Part I	At the end of this activity, students should be able to: discuss the formation of covalent bonds – indicate which elements form covalent bonds – explain the terms: Lewis dot-and-cross diagrams, structural formula and molecular formula – name the non-metals that occur in nature in the form of diatomic molecules – illustrate simple diatomic molecules using molecular formulae, structural formulae and Lewis diagrams – explain how multiple bonds are formed.
	Covalent Bonding. Part II	At the end of this activity, students should be able to: give the definition of valence – write down the formula for a molecule, knowing the valences or ionic charges – give examples of diatomic and polyatomic molecules – know that carbon atoms can form single, double or triple bonds with one another.
	Simple and Giant Molecular Solids	At the end of this activity, students should be able to: describe the structure of the crystal lattice of covalent compounds – define the terms simple molecular solid and giant molecular solid – give some examples of simple and giant molecular solids – describe the properties of elements and compounds forming simple molecular solids and giant molecular solid crystals – explain why certain giant molecular solids conduct electricity, and give examples of such solids.
	Allotropes	At the end of this activity, students should be able to: explain the phenomenon of allotropy – give examples of elements that occur in different allotropic forms – describe the allotropic forms of carbon, oxygen and sulphur – describe the physical properties of diamond and graphite – give examples of the uses of graphite and diamond – discuss the role of ozone in nature.
	Metallic Bonding	At the end of this activity, students should be able to: identify metals – describe the characteristic physical properties of metals – describe the position of metals in the periodic table and recall their electron configurations – describe the nature of metallic bonding based on the 'electron sea' model – explain how the properties of metals arise from their inner structure.
	Alloys	At the end of this activity, students should be able to: define alloys – give examples of iron, aluminium, copper and tin alloys – describe some uses of steel, brass, bronze and Duralumin – explain why alloys have different properties from pure metals.
V. Representing Chemical Reactions	Chemical and Physical Change	At the end of this activity, students should be able to: explain what a physical change and a chemical change involve – give examples of physical changes and chemical changes – discuss the methods for representing a chemical change – define the terms: reactant and product and identify them in a chemical equation.
	Chemical Equations	At the end of this activity, students should be able to: describe how the number of molecules and the number of atoms in a molecule are indicated – write down a simple chemical reaction using symbols for elements and formulae for compounds – balance simple chemical equations using stoichiometric coefficients – explain how the physical states of reactants are indicated in chemical equations – give the definition of a stoichiometric coefficient.



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	Reaction Types	At the end of this activity, students should be able to: explain the following reaction types: combination, decomposition, displacement, precipitation, neutralisation, oxidation reaction and reduction reaction, exothermic reaction, endothermic reaction, reversible reaction and irreversible reaction – name the type of reaction, given a chemical equation.
VI. Quantitative Aspects of Chemical Reactions	Atomic and Molecular Mass	At the end of this activity, students should be able to quote the law of conservation of mass and explain it on the basis of the particularity of matter, explain the terms: atomic mass and molecular mass, read the atomic masses of elements from the periodic table, calculate the molecular masses of chemical compounds, obtain information about the quantitative composition of chemical compounds from their molecular formulae, and use the different ways of representing the composition of substances.
	The Mole	At the end of this activity, students should be able to: the unit of quantity of matter – the mole – Avogadro's number – the molar mass – calculating the number of moles – interpreting molecular formulae in terms of moles – empirical formulae – calculating the percentage composition of a chemical compound.
	Using the Mole Concept	At the end of this activity, students should be able to: write a chemical equation using the molar interpretation – solve simple problems using the mole concept – calculate the mass of products or reactants in a chemical reaction – calculate the volumes of gaseous products – solve simple problems using the concept of molarity – calculate the molarity of an acid or base using acid-base titration.
VII. Acids, Bases and Salts	Properties of Acids	At the end of this activity, students should be able to: explain the properties of acids – name a few uses of acids – describe the structure of acids – give the definition of dissociation and understand this process – describe the dissociation of weak and strong acids.
	Properties of Bases	At the end of this activity, students should be able to: give the definition of a hydroxide – describe the properties of bases – describe the uses of bases – determine the structure of bases – give a definition of dissociation – define the terms 'strong' and 'weak' bases and describe their behaviour in water.
	Indicators and pH	At the end of this activity, students should be able to: state the purpose of indicators – determine the pH of a solution using an indicator – determine the acidity or alkalinity of a solution using the pH scale – indicate the colours corresponding to alkaline, neutral and acidic solutions on the pH scale – identify strong and weak acids and strong and weak alkalis on the basis of the pH value of their solutions – discuss the applications of pH measurements.
	Neutralisation Reactions	At the end of this activity, students should be able to: explain what neutralization involves and how it is carried out – determine the molecular formula of a salt – name salts – balance equations for neutralization reactions – discuss the practical applications of neutralisation reactions.
	Salts	At the end of this activity, students should be able to: give examples of salts occurring in nature – give examples of some uses of salts – discuss the dissociation of salts and specify the types of ion present in a solution of a salt – describe the reaction between a metal and an acid at the macroscopic and microscopic levels – discuss precipitation reactions, using appropriate examples – classify some common salts as soluble or insoluble – describe the thermal decomposition of carbonates.
	Reactions of Acids and Bases	At the end of this activity, students should be able to: discuss reactions between nonmetal oxides and water – discuss reactions between bases and nonmetal oxides – discuss reactions between acids and metal oxides – discuss reactions between carbonates or hydrogencarbonates and acids – discuss reactions between acids and a solution of ammonia.



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	Acid-Base Titration	At the end of this activity, students should be able to: describe the principles of titration and how it is carried out – discuss the aims of titration – calculate the mass of a solute – determine the concentration of a solution by titration – calculate the mass of solute in a titrated sample.
VIII. Water and Water Solutions	Properties of Water	At the end of this activity, students should be able to: describe the structure of the water molecule – explain the process of formation of hydrogen bonds – describe the process of dissolution of ionic compounds (electrolytic dissociation) – list methods for detecting the presence of water – explain what distilled water is – discuss the effect of the presence of other substances in water on water's freezing and boiling points.
	Solubility in Water	At the end of this activity, students should be able to: define the terms: saturated solution, solubility, crystallisation, solubility curve – describe the dissolution of gases, liquids and solids in water and discuss the effect of various physical factors on this process – use a solubility curve to find the number of grams of a solute that will be dissolved at a specific temperature and perform simple calculations using the data obtained from this graph.
	Natural Waters	At the end of this activity, students should be able to: explain what hard water is, the causes and types of water hardness – describe the methods for eliminating temporary and permanent hardness from water – name the main water pollutants and the sources of this pollution – describe methods for removing water pollution caused by petroleum and petroleum products – name the main processes carried out during water treatment – describe the main steps in wastewater purification.
	Colloids. Washing in Water	At the end of this activity, students should be able to: explain what colloids are – name the properties that distinguish colloids from other types of mixture (true solutions and suspensions) – list the types of colloid and give examples of them – explain what emulsifying agents are and what coagulation involves – explain how soap and detergents remove dirt – describe the behaviour of soap and detergents in hard water.
	The Periodic Table	At the end of this activity, students should be able to: give the criteria for the classification of the elements in the periodic table – state the group in which a given element occurs on the basis of the number of its valence electrons, and vice versa – state the period in which a given element occurs on the basis of the number of electron shells, and vice versa – determine whether a given element is a metal, a metalloid or a nonmetal from its position in the periodic table – give examples of similarities in the properties of elements within a given main group – give examples of periodic changes in the properties of elements that occur in the same period.
IX. The Periodic Table and Chemical Properties of the Elements	Noble Gases	At the end of this activity, students should be able to: write the electron configuration of the first three elements of Group 18 – describe the trends in the melting points, boiling points and densities in Group 18 – state the relationship between their atomic structure and the properties of the noble gases – account for the chemical inertness of the noble gases – give an example of a compound of a noble gas – give examples of the uses of the noble gases.
	Alkali Metals	At the end of this activity, students should be able to: describe the electron configuration of the alkali metals – describe the trends in the melting points and the boiling points of Group 1 elements – describe the trends in the density of Group 1 elements – explain the relationship between the atomic structure and the properties of the alkali metals – describe the trends in the reactivity of the alkali metals – describe the trends in the atomic radii of the Group 1 metals.



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	Reactions of Alkali Metals	At the end of this activity, students should be able to: describe the electron configuration of alkali metals – write equations for the reactions of alkali metals with water, the halogens and oxygen – know the relationship between the structure of the halides of alkali metals and their properties – know the relationship between the structure of the oxides of alkali metals and their properties – describe the uses of alkali metal compounds.
	Alkaline Earth Metals. Group 2	At the end of this activity, students should be able to: describe the electron configuration of Group 2 metals – write equations for the reactions of the alkaline earth metals with water and oxygen – describe the relationship between the structure of the Group 2 elements and their chemical and physical properties – compare the reactivity of the metals of Groups 1 and 2 of the periodic table.
	Halogens. Group 17	At the end of this activity, students should be able to: represent the electron configuration of the elements of Group 17 – explain the formation of halogen molecules – compare the solubility of halogens in water and in hexane and give reasons for the differences – describe the trends in the melting points and boiling points in Group 17 – describe the relationship between the atomic structure and the physical properties of the elements – mention the uses of halogens and their compounds.
	Reactions of the Halogens	At the end of this activity, students should be able to: account for the high reactivity of the halogens – describe the trend in the reactivity with increasing atomic number of the halogens within the group – explain why chlorine is more reactive than bromine – write equations for reactions of halogens with metals and hydrogen – account for the acidic character of hydrogen halides – mention the most important properties and applications of hydrochloric acid – predict whether a molecule of a given halogen will react with a simple ion of another halogen.
	Transition Elements	At the end of this activity, students should be able to: describe the position of the transition elements in the periodic table – give examples of transition elements – describe the basic physical properties of transition elements – name the properties that are characteristic of transition elements – give examples of transition elements used as catalysts.
X. Reactivity of Metals	The Reactivity Series	At the end of this activity, students should be able to: explain what the reactivity series of metals is and what can be predicted from it – determine the reactivity of a metal from its position in the reactivity series – describe how metals react with hydrochloric acid, cold water, steam and oxygen – state which metals displace hydrogen from acids on the basis of the reactivity series – explain what noble metals are and what chemical properties they have in common.
	Reactions Involving Metals	At the end of this activity, students should be able to: use the reactivity series to predict the direction of displacement of metals by other metals from solutions of their salts – know that metal ores occur in the Earth's crust – know how metals are extracted from their ores – know that the method for the extraction of a particular metal from its ore depends on the reactivity of this metal – explain what the process of corrosion involves – name the factors that influence the rate of corrosion of iron – explain how to prevent corrosion.
	Electrochemical Cells	At the end of this activity, students should be able to: define a voltaic cell; - explain the structure and the principles of a voltaic cell – give an example of a chemical reaction that occurs in a cell – write equations for half-reactions in a voltaic cell – discuss the principles of a fuel cell – discuss the practical applications of voltaic cells and fuel cells.



CHAPTER	LESSON	DESCRIPTION
XI. Electrolysis	Conductivity of Electrolytes	At the end of this activity, students should be able to: know why some substances conduct an electric current in the molten state or in aqueous solutions – know what electrolytes are – explain how to distinguish between an electrolyte and a non-electrolyte – give examples of electrical conductors – determine which ions are present in a molten salt – specify which ions are present in a solution of an electrolyte.
	Electrolysis	At the end of this activity, students should be able to: say what electrolysis is and how it is carried out describe the apparatus for carrying out electrolysis identify the cathode and anode in an operating electrolyzer determine the products of electrolysis of typical molten salts and typical aqueous solutions write equations for the electrode reactions that occur during the electrolysis of typical solutions.
	Applications of Electrolysis and Calculations Connected with Electrolysis	At the end of this activity, students should be able to: describe how the electrolysis of brine proceeds , explain what electroplating involves, name the uses of electrolysis, calculate the quantity of product prepared by an electrolysis, calculate the time during which electric current must be applied to yield a given amount of a product by electrolysis.
XII. Organic Chemistry	Alkanes	At the end of this activity, students should be able to: indicate which compounds are classed as organic compounds, on the basis of their chemical formulae, explain the terms: hydrocarbons, saturated hydrocarbons, alkanes and homologous series, give the names and formulae of the individual members of the homologous series of alkanes containing from 1 to 10 carbon atoms.
	Isomerism of Alkanes	At the end of this activity, students should be able to: define the terms isomerism and isomers, explain what alkyl groups are and give the names of alkyl groups corresponding to individual members of the homologous series of alkanes, name simple isomers of straight chain alkanes that have one substituent or several substituents of the same type, and isomers that have different substituents, explain why straight chain alkanes are characterised by higher boiling and melting points than their branched isomers.
	Alkenes	At the end of this activity, students should be able to: explain the term unsaturated hydrocarbons or alkenes, give the names and formulae of simple alkenes and isomers that differ in the position of the double bond, describe the addition reactions of bromine and hydrogen to alkenes, discuss the rules of nomenclature for brominated derivatives of alkenes.
	Alcohols	At the end of this activity, students should be able to: explain what alcohols are, give names and formulae for common monohydric alcohols, describe the methods for obtaining ethanol, and discuss its uses, describe the reaction between ethanol and sodium, and the dehydration reaction, give examples of dihydric and trihydric alcohols.
	Carboxylic Acids	At the end of this activity, students should be able to: explain what carboxylic acids and esters are, give the names and formulae of common carboxylic acids, discuss the chemical properties of carboxylic acids (acidity of aqueous solutions), write down the reactions of ethanoic or methanoic acid with magnesium, copper(II) oxide and carbonates, give examples of higher fatty acids, discuss the structure of soaps, write down the reaction for esterification and specify the conditions under which it proceeds.
XIII. Chemical Reactions	Endothermic and Exothermic Reactions	At the end of this activity, students should be able to: describe the phenomenon of energy transfer in a chemical reaction, define exothermic and endothermic reactions, identify exothermic and endothermic reactions, draw energy diagrams, do simple calculations associated with energy transfer during a chemical reaction.
	Reversible Reactions and Chemical Equilibrium	At the end of this activity, students should be able to: know what irreversible and reversible processes are, give examples of reversible and irreversible processes, explain the state of dynamic equilibrium, know what factors affect equilibrium, apply Le Chatelier's principle in reversible reactions



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	Reaction Rate	At the end of this activity, students should be able to: define reaction rate as the change of concentration of reactants or products with time, give examples of fast and slow reactions, draw a graph showing changes of concentration with time, find reaction rates from given experimental data, describe the basic methods for the determination of reaction rates, describe the economic importance of reaction rates.
	Factors Affecting Reaction Rate	At the end of this activity, students should be able to: explain the collision theory give the factors affecting chemical reaction rates propose methods for increasing a reaction rate define a catalyst.
	Catalysts	At the end of this activity, students should be able to: define catalysts, explain the concept of activation energy, explain the mechanism of catalyst action, give examples of applications of catalysts, identify the benefits of using catalysts in industry.
	Enzymes – Biological Catalysts	At the end of this activity, students should be able to: explain how to significantly increase the reaction rate, define enzymes and give examples of them, describe the action of enzymes and their importance in everyday life, explain the process of fermentation, define biotechnological process, give an example of biotechnological process.
XIV. Useful Products From Organic Sources	Fossil Fuels and Crude Oil	At the end of this activity, students should be able to: understand the role of fossil fuels, know the origin of fossil fuels, know the location of the main deposits of fossil fuels in the world, understand the fractional distillation process.
	Cracking and Combustion of Hydrocarbons	At the end of this activity, students should be able to: know and understand the cracking process, understand what octane rating means, know the products from the complete and the incomplete combustion of hydrocarbons.
	Polymers	At the end of this activity, students should be able to: define the terms - monomer, polymer, polymerization, describe the structures of polymers and classify them according to the structure of macromolecules, define a copolymer, indicate everyday objects that are made of plastic, mention the basic properties of polymers, explain the terms thermoplastics and thermosetting plastics, describe the uses of at least three different polymers.
	Environmental Impact of Oil Products	At the end of this activity, students should be able to: know how to identify the products from the complete combustion of hydrocarbons, understand the origin of unwanted industry-related effects in the atmosphere, know what we could do to combat the greenhouse effect, acid rains, increasing amounts of plastic litter, understand the difference between total and incomplete combustion of hydrocarbons.
XV. Useful Products from Rocks	Metals from Metal Ores	At the end of this activity, students should be able to: mention the most important chemical elements which make up the Earth's crust, give the names of minerals that contain iron, aluminum, titanium and copper and write their chemical formulas, predict, on the basis of the reactivity series of the metals, whether a given metal can displace another metal from its compounds, discuss the methods for metal extraction from ores.
	Iron	At the end of this activity, students should be able to: describe the method for the extraction of iron in a blast furnace, explain the production process for steel, describe the corrosion of iron and steel, describe methods for the protection of iron and steel against corrosion.
	Aluminum	At the end of this activity, students should be able to: name the ores of aluminum, describe the process of extracting aluminum from bauxite, using aluminum as an example, discuss the phenomenon of passivation, mention the most important uses of aluminum, explain how aluminum is recycled and indicate the benefits of this process.



CHAPTER	LESSON	DESCRIPTION
	Copper and Titanium	At the end of this activity, students should be able to: name the minerals that contain copper and titanium, discuss methods for the extraction and refining of copper, describe the method for the extraction of titanium, explain why titanium and copper do not corrode, state the uses of copper and titanium.
	Industrial Uses of Limestone	At the end of this activity, students should be able to: name the types of rock that contain calcium carbonate, describe the reactions that occur in limestone in the presence of carbon dioxide and water, explain what quicklime and slaked lime are and how they are prepared, explain the terms mortar, cement, concrete and glass, describe the methods of preparation and applications of these materials.
	Sulfur and Sulfuric(VI) Acid	At the end of this activity, students should be able to: name the principal minerals that contain sulfur, discuss the properties of sulfur, describe the methods for the extraction and the combustion reactions of sulfur, discuss the process for manufacturing and the hygroscopic properties of sulfuric(VI) acid, discuss the uses of sulfur and sulfuric(VI) acid, describe the effect of sulfur dioxide on living organisms and on the process of corrosion.
XVI. Useful Products from Air	Air	At the end of this activity, students should be able to: name the constituents of clean air, name the pollutants of air, their sources and environmental impact, explain the terms 'acid rain' and 'smog', discuss the preparation of oxygen and nitrogen from air, describe the properties of oxygen and its applications.
	Ammonia and Nitric Acid	At the end of this activity, students should be able to: describe the properties of nitrogen, and its uses, describe the properties of ammonia and the method for its synthesis on an industrial scale, describe the properties of nitric(V) acid and the steps in its preparation from ammonia, give the definition of reaction yield and be able to use it in simple calculations.
	Fertilizers	At the end of this activity, students should be able to: discuss the structure of soil, name the basic elements essential for plants and discuss their effect on plants, give natural and artificial sources of these elements, describe the processes for preparing basic artificial fertilizers containing nitrogen, phosphorus and potassium, describe the effect of fertilizers on water basins or reservoirs, and ways of preventing the pollution of surface water with fertilizers.
XVII. Food and Drugs	Carbohydrates	At the end of this activity, students should be able to: give the definitions of carbohydrates, mono-, di- and polysaccharides, describe the structures of glucose, fructose, sucrose, starch, cellulose and glycogen, describe the properties of these compounds and give reactions for their identification, discuss the importance of carbohydrates in the diet.
	Proteins	At the end of this activity, students should be able to: describe what amino acids, polypeptides and proteins are, discuss the spatial structure of proteins, explain the phenomenon of denaturation and name the factors that cause it, describe the color reactions used for the detection of proteins.
	Fats	At the end of this activity, students should be able to: describe the structure of a fat molecule, classify fats according to their physical state, origin and structure, describe the reactions of saponification and the hardening of oils, give the uses of fats.
	Food and Drugs	At the end of this activity, students should be able to: explain what vitamins are and classify them as water-soluble or fat-soluble, mention some sources of vitamins, discuss methods for protecting food against the adverse effect of bacteria and oxygen, explain the terms: avitaminosis, hypervitaminosis, antivitamin, functional food, antibiotics.



CHAPTER	LESSON	DESCRIPTION
XVIII. Chemistry and the Earth	The Structure of the Earth	At the end of this activity, students should be able to: define the relative positions of the Earth, Moon and Sun in the Universe, name the layers of the Earth, describe the properties of the main layers within the Earth, compare the abundance of elements in the Earth's crust and in the whole of the Earth, specify the sources of information used to determine the structure of the inner part of the Earth, describe how density, pressure and temperature vary with depth from the surface, specify the position of the magnetic poles of the Earth.
	Tectonic Plates	At the end of this activity, students should be able to: say what tectonic plates are and describe their properties, explain why tectonic plates shift, explain what happens in places where the edges of tectonic plates meet, describe what divergent, convergent and transform boundaries are, give evidence for the expansion of the ocean floor, present the evidence for the changes in the Earth's magnetic field in the past, say how continents move, give the evidence for continental drift.
	Tectonic Movements, Earthquakes and Volcanoes	At the end of this activity, students should be able to: explain how volcanoes form, explain why earthquakes occur and describe where they occur most often, show the location of volcanoes on the Earth, using a map with the tectonic plates marked on it, show the location of seismic zones on the Earth, using a map with the tectonic plates marked on it, describe the effect of the processes involving tectonic plates on the formation of volcanoes and earthquakes, describe the applications of the Richter scale.
	Igneous Rocks	At the end of this activity, students should be able to: explain what minerals are, what rocks are composed of and what is the difference between a rock and a mineral, explain which chemical compounds are the principal components of magma, explain how igneous rocks are formed and classify them according to the form of their crystals, distinguish between intrusive and extrusive rocks, give examples of the most common igneous rocks and explain the differences between them, list the characteristic properties of igneous rocks, know the applications of igneous rocks.
	Sedimentary Rocks. Part I	At the end of this activity, students should be able to: explain what weathering is and list the factors that influence this process, name and describe the types of rock weathering, give examples of physical, chemical and biological weathering, explain what erosion involves and give examples of different forms of erosion, name the ways in which weathered rocks are transported, discuss rock transportation by water, wind and glaciers, explain the origin of sediments on sea and ocean floors.
	Sedimentary Rocks. Part II	At the end of this activity, students should be able to: explain how sedimentary rocks were formed, account for the order in which rock layers are arranged, explain how fossils were formed, determine the age of rock layers on the basis of the fossils found in them, give examples of the most common sedimentary rocks and explain the differences between them, name the characteristic properties of sedimentary rocks, describe the principal component of limestone rocks.
	Metamorphic Rocks and Circulation of Rock Material	At the end of this activity, students should be able to: explain how metamorphic rocks are formed, give examples of the most common metamorphic rocks, mention the characteristic properties of metamorphic rocks, discuss the 'rock cycle', recognize the basic types of rock on the basis of their characteristic properties.
	The Atmosphere	At the end of this activity, students should be able to: explain how the Earth's atmosphere evolved before reaching its present composition, describe the approximate percentage composition of the atmosphere at present, discuss the structure of the atmosphere, describe the process of formation of radicals by the break-up of a covalent bond, explain how chlorine radicals can deplete the ozone layer, explain the effect of the ozone-hole expansion on human health, explain how the ozone layer is formed, describe the causes of the greenhouse effect, and what impact it could have on the living conditions on Earth.



CHAPTER	LESSON	DESCRIPTION
	Oceans	At the end of this activity, students should be able to: explain how the oceans were formed, explain the origin of salts in the oceans, list the characteristic properties of sea water, list the most abundant ions in sea water, discuss the concentration of salts in oceans, discuss salinity balance, discuss the role of the oceans in maintaining the composition of the atmosphere, discuss the economic importance of the oceans.
XIX. Laboratory Techniques and Analytical Tests	Handling Liquids	At the end of this activity, students should be able to: explain the purpose of a graduated cylinder, pipette and burette and describe how they are used, describe how to transfer a liquid from a bottle to a beaker, carry out a temperature measurement and determination of the pH and odour of a liquid, determine the age of rock layers on the basis of the fossils found in them, heat a liquid in a test-tube in a safe way.
	Handling Solids. Heating	At the end of this activity, students should be able to: describe how solids are stored, give guidelines on how to correctly transfer solids from containers, and how to weigh and crush solids, explain what decantation, filtration and evaporation involve and why these techniques are used, discuss the structure of the Bunsen burner and its safe use.
	Gases: Handling and Laboratory Tests	At the end of this activity, students should be able to: describe the set-up used for collecting gases, prepare equipment for measuring the volume of gases evolved from various chemical reactions, describe methods for obtaining oxygen, hydrogen and carbon dioxide in a chemistry lab and for the identification of these gases, discuss how to use indicator paper when investigating gases.
	Testing for Ions	At the end of this activity, students should be able to: explain what a flame test involves, give the flame colors characteristic of lithium, sodium, potassium, barium, calcium, copper and lead, and be able to distinguish between these metals on the basis of their flame colours, describe simple methods for detecting ammonium, carbonate, sulfate(VI), sulfate(IV) and halide ions.
XX. Safety in the Chemical Laboratory	Safety in the Chemical Laboratory	At the end of this activity, students should be able to: recognise the types of hazardous substance on the basis of the hazard symbols, read the hazards involved in contact with a given substance and the guidelines for handling on the basis of the R and S symbols, specify appropriate personal protective equipment, discuss the principles for the safe conduct of experiments, describe the procedure in an emergency.