CHAPTER	LESSON	DESCRIPTION
I. Chapter Title	**Lesson Title**	Description
II. Chemistry of Organisms	**Chemical Elements of the Cell**	At the end of this activity, students should be able to define biogenic elements and present their basic role in the formation of organic compounds, explain the meanings of the terms 'macro-elements', 'trace elements' and 'ultra-trace elements' and present examples of the biological significance of these elements, and discuss the most important properties of water (from a biological point of view) and their significance in the world of living organisms.
	Carbohydrates: their Structure, Properties, Occurrence, and Importance	At the end of this activity, students should be able to define carbohydrates, monosaccharides, disaccharides and polysaccharides and give examples of carbohydrates representing these classes, describe the occurrence and functions of the most important carbohydrates, describe the characteristic properties of monosaccharides, disaccharides, storage polysaccharides and structural polysaccharide and explain the reactions of hydrolysis and condensation of carbohydrates and their importance.
	Lipids: Structure, Properties, Occurence, and Importance	At the end of this activity, students should be able to describe the structure of lipids and their major groups, describe the structure of fatty acids and their significance as metabolic fuel and structural components of different groups of lipids, - describe the structure of a triacylglycerol molecule and the role of triacylglycerols in living organisms, understand the bipolar character of the structure of phospholipid molecules and its biological significance and describe the importance of cholesterol as a component of cell membranes and a substrate for the synthesis of steroid hormones and vitamin D3.
	Proteins	At the end of this activity, students should be able to present the general structure of amino acids, describe the formation of a peptide bond, describe four levels of organization of protein molecules and explain how they are formed and explain the significance of the primary structure of protein in the configuration of proteins.
	Biochemical Tests, Chromatography, Electrophoresis, and Separation of Tissues	At the end of this activity, students should be able to know how to detect sugars, reducing sugars, polysaccharides, fats and proteins in biological material, define electrophoresis and describe the components of an electrophoresis unit and the principles of electrophoretic separation, define chromatography and describe the components of a paper chromatography unit and explain the concept of relative front and its application in chromatography.
III. Basics of Cytology	**Morphology of Prokaryotic and Eukaryotic Cells as Seen under the Light Microscope**	At the end of this activity, students should be able to describe the differences in the structure of eukaryotic and prokaryotic cells, describe the similarities and differences between eukaryotic cells, determine the size of objects using the light microscope, determine the number of cells using the light microscope and explain how the transport of respiratory gases is organized.
	Current Techniques in Cytology	At the end of this activity, students should be able to describe the principles of light and electron microscopy and centrifugation and give examples of specific areas of biological research in which the above techniques can be applied.
	Cell Ultrastructures	At the end of this activity, students should be able to describe the structure and functions of the nucleus, cytoplasm and cytosol, define the structure and functions of rough endoplasmic reticulum (RER), SER (smooth endoplasmic reticulum), ribosomes, the Golgi body and the cytoskeleton, describe the structure and role of cell wall and membrane, define the structure and function of the mitochondrion, chloroplast and vacuole and describe the structure of the cell and the basic roles of cellular organelles.
	Specialization of Cells	At the end of this activity, students should be able to define the features of stem cells, explain determination and differentiation of cells and tissues of cells and tissues and name the basic characteristics of such cells and name and discuss examples of differentiated cells in animals and plants.

CHAPTER	LESSON	DESCRIPTION
	Transport Across Membranes	At the end of this activity, students should be able to describe, compare and contrast the processes of osmosis and diffusion, know the principles of Fick's first law, explain the importance of passive and active transport and cytosis and explain the following terms: "isotonic", "hypotonic" and "hypertonic", "water potential", "osmotic potential" and "osmotic pressure".
	Cell Division – Mitosis	At the end of this activity, students should be able to describe the process of mitosis, describe the cell cycle, describe changes in chromosome structure during the cell cycle and mitosis and explain the importance of mitosis.
	Cell Division – Meiosis	At the end of this activity, students should be able to describe the process of meiosis, describe changes in chromosome structure during the cell cycle and meiosis, explain the importance of meiosis and explain the differences between mitosis and meiosis.
IV. Taxonomy	**Taxonomy**	At the end of this activity, students should be able to prepare a simple classification of species based on their characteristics, understand the reasons for the differences between the various systems of classification of living organisms, explain the cardiac cycle, know the principles of classification of species based on their phenotypical characteristics and the properties of their genome and understand the importance of the degree of kinship and phylogeny in the classification of species.
	Prokaryotes – Simple Organisms with No Nucleus	At the end of this activity, students should be able to name the basic characteristics of prokaryotes, name the basic differences between Archaea and Eubacteria, name the basic differences between Gram-positive and Gram-negative bacteria and recognise the basic types of bacteria.
	Protista	At the end of this activity, students should be able to describe the basic characteristics of eukaryotes and protests, name the basic differences between protists and tissue organisms, differentiate between the groups of protests, list the diverse modes of adaptation to environmental conditions developed by protests and list the diverse modes of reproduction in protists.
	Fungi	At the end of this activity, students should be able to describe the basic features of fungi and differentiate between the basic phyla of fungi, recognise the different types of adaptations to the environment in fungi, recognise the similarities in the methods of reproduction in fungi and describe the significance of fungi in nature.
	Plants	At the end of this activity, students should be able to indicate the basic features of plants, distinguish the basic groups of plants, recognise the diversity of plant forms and recognise the similarities and differences in the life cycles of bryophytes, pteridophytes and seed plants.
	Animals – the Invertebrates	At the end of this activity, students should be able to recognise the variety of adaptations in the invertebrate groups, indicate, using selected examples, the characteristic features of each invertebrate group, assign animals to a specific invertebrate group and recognise the structural and functional similarities and differences in selected examples of the invertebrate groups.
	Animals – the Vertebrates	At the end of this activity, students should be able to recognize the multitude of adaptations of particular vertebrate groups, indicate the characteristic features of vertebrate groups using examples, place particular animals into the correct vertebrate groups and recognize the similarities in structure and function in selected examples of vertebrate groups.

CHAPTER	LESSON	DESCRIPTION
V. Metabolism	**Enzymes as Biocatalysts**	At the end of this activity, students should be able to present the components of enzymes, explain the catalytic activity of enzymes, and how reaction rate depends on substrate and enzyme concentrations, explain the substrate specificity of enzymes and the difference between "the lock-and-key" and "induced fit" hypotheses, present the effects of temperature and pH on enzyme activity, present the mechanisms of competitive and non-competitive inhibition of enzyme activity and present the principles of enzyme classification and name the main classes of enzymes.
	Industrial Uses of Enzymes	At the end of this activity, students should be able to present examples of industrial uses of enzymes, produce a diagram of the production of an enzymatic protein and explain the characteristics of enzymes that make them useful in technology.
	Uses of Enzymes in Medical Laboratories	At the end of this activity, students should be able to explain why enzymatic methods are better than chemical methods in determining the substances found in body fluids, present an enzymatic method for determining glucose concentration, explain how a biosensor operates, present several uses of the ELISA technique and explain how it functions, as well as explain how determining the quantity of certain enzymes in the blood is helpful in diagnosing organ damage and present examples of enzymes used to diagnose diseases.
	Metabolic Transformations	At the end of this activity, students should be able to define metabolism, describe the characteristics of catabolism and anabolism, define exergonic and endergonic reactiong, indicate the sites in a cell where the most important metabolic transformations take place, describe the role of ATP in cellular metabolism, define phosphorylation, present its types and where they occur in a cell and explain the role of coenzyme A in cellular metabolism.
	Autotrophic Nutrition and Photosynthesis	At the end of this activity, students should be able to define autotrophic and heterotrophic nutrition, name photo-autotrophs and chemo-autotrophs, explain photosynthesis and chemosynthesis and define the role of pigments in photosynthesis.
	Biochemistry of Photosynthesis	At the end of this activity, students should be able to present the structure of chloroplasts, differentiate between light-dependent and light-independent reactions, define the sites in the chloroplast at which particular reactions occur, explain the light-dependent phase, name three phases of the Calvin cycle and name the products of photosynthesis.
	Factors Affecting Photosynthesis	At the end of this activity, students should be able to know how light, water, temperature and carbon dioxide levels affect photosynthesis and describe how to test for the four factors listed above.
	Cell Respiration	At the end of this activity, students should be able to explain the concept of cell respiration, present the role of ATP in metabolic processes, define the respiratory quotient, discuss the electron transport chain, explain what glycolysis involves and where it occurs, present the major stages of glycolysis, explain the Krebs cycle and explain the process of fermentation and its significance in nature and the human economy.
	Aerobic Respiration	At the end of this activity, students should be able to explain the concept of cell respiration, present the role of ATP in metabolic processes, define the respiratory quotient, discuss the electron transport chain, explain what glycolysis involves and where it occurs, present the major stages of glycolysis and explain the Krebs cycle.
VI. Nervous Coordination	**Excitability of Neurons**	At the end of this activity, students should be able to describe the structure of a neurone, define two functional states of a neurone, describe the conduction of a nerve impulse along an axon and explain the relationship between the speed of conduction, the presence of a myelin sheath and axon diameter.

CHAPTER	LESSON	DESCRIPTION
	Transmission of Nerve Impulses from Cell to Cell – Synapses	At the end of this activity, students should be able to describe the function and structure of a chemical synapse, define excitatory synapse and inhibitory synapse and describe the conduction of a nerve impulse along an axon.
	Structure of the Human Nervous System	At the end of this activity, students should be able to classify the nervous system, define excitatory and inhibitory synapses, describe the structure of the brain, spinal cord and nerves, and explain the relationship between the central and peripheral nervous systems on the basis of their structure and functions.
	Involuntary Functioning of the Nervous System	At the end of this activity, students should be able to define and describe the basic characteristics of a reflex arc and give examples of the functioning of monosynaptic and polysynaptic reflexes.
	Autonomic Nervous System	At the end of this activity, students should be able to define and describe the parts of the ANS, show the location of particular types of neurone in the ANS, define and describe the functions of the antagonistic divisions of the ANS, explain, with examples, the antagonistic effects of the ANS on the body, describe the function and effects of acetylcholine and noradrenaline in the ANS and describe the 'fight-or-flight' reaction and the nervous and endocrine systems responsible for this.
	Receptors	At the end of this activity, students should be able to define and describe the basic characteristics of receptors (specificity, threshold) and describe the process of sensory transduction (receptor and action potentials);- describe the functioning of the receptors of touch, pressure, hearing, balance and pain.
	The Eye	At the end of this activity, students should be able to define and describe the structure and function of the eye, describe the process of impulse generation and transduction in the eye and give examples of good habits while reading or writing.
	Animal Behavior as a Form of Adaptation to the Environment	At the end of this activity, students should be able to: understand the adaptational role of behavior, understand the role of genetic information in passing on behavior patterns, understand the role of experience in the modification of an individual's behavior, differentiate between the various forms of behavior, and understand the association between the evolution of the animal nervous system and the development of controlled behavior.
VII. Food Ingestion and Digestion	**Heterotrophic Nutrition**	At the end of this activity, students should be able to: define heterotrophic nutrition, define digestion, present the types of digestion, present examples of heterotrophic organisms, describe saprotrophic nutrition using fungi as an example, explain how nutritional requirements in animals change at different stages of development.
	Nutrients	At the end of this activity, students should be able to: define the role of proteins, lipids, carbohydrates, vitamins and mineral compounds in human nutrition and name foods that are the source of essential chemical compounds vital nutrients.
	Nutritional Requirements	At the end of this activity, students should be able to define basal metabolic rate and the conditions under which it should be calculated, name the factors affecting the basal and active metabolic rates, define the role of carbohydrates and fats in meeting daily energy requirements, define complete and incomplete proteins and give examples of products containing such proteins, and explain what a vegetarian diet involves and present its advantages and disadvantages.
	The Human Digestive System	At the end of this activity, students should be able to describe the structure of the alimentary system, define the significance of the glands that empty into the alimentary canal, define digestion, and explain how digestive enzymes work.

CHAPTER	LESSON	DESCRIPTION
	The Processes of Food Digestion	At the end of this activity, students should be able to describe the digestion of carbohydrates, proteins, fats and nucleic acids and describe the nervous and hormonal regulation of the secretion of digestive juices.
	Absorption of Digestion Products	At the end of this activity, students should be able to present the histology of the wall of the alimentary canal, define the site of the absorption of digestion products, and define the mode of absorption of digestion products.
	Digestion of Cellulose	At the end of this activity, students should be able to name the symbiotic organisms of the digestive system, define the role of symbionts in cellulose digestion, present the structure of the ruminant stomach, and describe the function of the ruminant stomach.
VIII. Internal Transport	**Transport of Substances in Animals**	At the end of this activity, students should be able to explain the reasons for the development of the circulatory system in animals, describe the structure of blood, describe the structure and function of blood vessels, describe the adaptation of erythrocytes to oxygen transportation, and explain the significance of tissue fluid and the lymphatic system.
	Structure and Functions of the Heart	At the end of this activity, students should be able to outline the structure of the circulatory system in mammals, describe the structure of the heart, using a model or an illustration, explain the cardiac cycle, describe the regulation of heart rate by the nervous and endocrine systems and describe the effect of physical activity on blood flow through the organs during the resting state and during physical effort.
	Transport of Substances in Plants	At the end of this activity, students should be able to describe the morphology of vascular tissues – the xylem and phloem, demonstrate the adaptation of a root for the absorption of water and dissolved mineral salts, describe the pathway of water transport in root cells, determine the factors that cause flow of water in vessels, and explain how transport takes place in phloem.
	Transpiration	At the end of this activity, students should be able to define transpiration, describe the types of transpiration, describe the pathway of water transport in root cells, describe the effects of environmental factors on transpiration, and present the adaptations of plants for survival in dry conditions.
IX. Respiratory Gas Exchange	**Respiratory Surfaces**	At the end of this activity, students should be able to: present the factors that affect the diffusion of gases across respiratory surfaces, present the main types of respiratory organs in animals, explain the functioning of gills in fish, present the anatomical features that enable gas exchange on land, using plants and insects as examples, discuss gas exchange in relation to water evaporation from the body surface, and present the main structural features and the principles of lung ventilation in land vertebrates.
	Transport of Respiratory Gases	At the end of this activity, students should be able to explain the role of respiratory pigments in the transport of oxygen by body fluids, present the structure of hemoglobin A, describe the oxygen dissociation curve for hemoglobin, explain the physiological importance of the Bohr effect and the role of BPG in the transport of oxygen by hemoglobin, explain the association between the high oxygen affinity of fetal myoglobin and hemoglobin and their functions, and describe carbon dioxide transport and the role of hemoglobin in this process.
	Physiology of the Human Respiratory System	At the end of this activity, students should be able to describe the anatomy of the respiratory system, explain the functions of the parts of the respiratory system, describe the histological structure of the lung and alveoli, explain the mechanisms of pulmonary ventilation, and give examples of the organism's adaptations to low levels of oxygen.

CHAPTER	LESSON	DESCRIPTION
X. Physiology of Muscles	**Physiology of Muscle Contractions**	At the end of this activity, students should be able to describe the macroscopic and microscopic structure of skeletal muscle, describe the principles of the sliding filament theory of contraction and compare and contrast slow (red) and fast (white) muscle fibres.
	Chemistry of Muscle Contraction	At the end of this activity, students should be able to describe the molecular basis of the sliding theory of contraction, describe the transmission of a stimulus from a nerve to a sarcomere and explain the principles of aerobic and anaerobic metabolism in skeletal muscles.
XI. Reproduction	**Physiology of the Human Reproductive System**	At the end of this activity, students should be able to describe the structure of the male and female reproductive systems, differentiate between the tissues of the testes and ovaries, describe the process of spermatogenesis in the testes and oogenesis in the ovaries and describe the structure of sperm and egg cells.
	Fertilization	At the end of this activity, students should be able to explain what hormonal regulation of the menstrual cycle involves, describe the fusion of the egg and sperm cells and describe the development of the blastocyst and its implantation in the uterine wall.
	Development of the Human Embryo	At the end of this activity, students should be able to explain how fertilization occurs, name the initial stages of embryo development: cleavage and gastrulation, define the role of the placenta, describe the gradual development of the embryo and fetus and present the stages of labour.
	Birth Control in Humans and Animals	At the end of this activity, students should be able to explain how hormones regulate female fertility, describe the oestrous cycle in farm animals, list the methods for increasing the reproductive capacity of farm animals and describe the influence of bovine somatotropin on the lactation of farm animals.
	Growth and Development of the Organism	At the end of this activity, students should be able to define growth and development, name the various types of growth of organisms, interpret growth curves, describe the changes that take place in the female during puberty, describe the changes that take place in the male during puberty and explain the role of hormones in the growth and development of the organism.
	The Aging Process	At the end of this activity, students should be able to describe the age-related changes in the nervous system, describe the age-related changes in the sensory systems, describe age-related changes in the respiratory and circulatory systems, explain how aging affects BMR, describe the regression of tissues with reference to bony and cartilaginous tissues, and describe the hormonal changes during menopause.
	Sexual Reproduction in Plants	At the end of this activity, students should be able to describe the flower structure in angiosperms, describe the development of a pollen grain and embryo sac, define pollination, present mechanisms for protection against self-pollination, explain what double fertilization involves, and describe the formation of a seed and a fruit.
XII. Homeostasis	**The Concept of Homeostasis**	At the end of this activity, students should be able to: define the internal environment of the human organism, define homeostasis, name the homeostatic mechanisms, describe the mechanisms of negative and positive feedback, and give examples of the processes regulated by negative and positive feedback.

CHAPTER	LESSON	DESCRIPTION
	Hormonal Regulation	At the end of this activity, students should be able to define a hormone, name the main human endocrine glands and the principal hormones secreted by these glands, present the difference in the effects of three groups of hormones on cells, present the relationship between the hypothalamus, pituitary and the glands controlled by the pituitary, present the physiological action of selected hormones, describe the hormonal regulation of calcium ion concentration in extracellular fluid and describe the role of hormones in the metamorphosis of insects.
	Thermoregulation	At the end of this activity, students should be able to define homeothermy and the mechanisms of heat exchange between organisms and their environment, present the relationship between the metabolic rate and the temperature of the environment in ectotherms and endotherms, explain the concept of thermogenesis and its regulation, name the elements of the thermoregulatory system, describe the reactions that take place in the thermoregulatory system in response to an increase or decrease n the temperature of the environment and define hypothermia, hyperthermia and fever.
	Regulation of Glucose Level in the Blood	At the end of this activity, students should be able to: explain the dangers resulting from excessively high or low glucose levels in the blood, present the effects of insulin and glucagon on glucose metabolism, and present the most important metabolic disorders in diabetes.
	The Liver as a Homeostatic Organ	At the end of this activity, students should be able to describe the general structure of the liver, its location and vascularization, name the major functions of the liver, describe the transformations of carbohydrates, proteins and fats that occur in the liver, and name the major components of bile and discuss the role of bile in metabolism of fats.
	Role of the Kidneys in Regulating Water-Electrolyte Balance – Part 1	At the end of this activity, students should be able to present the types of nitrogenous waste compounds produced by the catabolism of nitrogenous compounds in different animals according to their environment, define filtration, reabsorption and secretion, describe the function of the renal tubule and the filtration in the glomerulus, describe the structures of the human excretory system and the structure of the nephron, and explain the mechanism of reabsorption in the proximal tubule of the nephron.
	Role of the Kidneys in Regulating Water-Electrolyte Balance – Part 2	At the end of this activity, students should be able to describe the structure of the loop of Henle and its role in the concentration of urine, explain the principles of the counter-current multiplier system and counter-current exchange, explain the role of ADH and aldosterone in the regulation of the volume and solute concentration of body fluids, explain the role of the kidneys in the regulation of blood pH, describe the regulation of water balance in humans, and describe the composition of urine and the urination reflex.
	Regulation of Water Loss in Desert Animals	At the end of this activity, students should be able to recognize the different adaptations of animals to life in a water-deficient environment, understand the basic mechanisms that limit water loss in desert animals, and understand the basic principles of water management in desert animals.
XIII. Human Health	**Characteristics of a Healthy Organism**	At the end of this activity, students should be able to define lifestyle and health, describe a balanced diet, specify the characteristics of anorexia and bulimia and describe the dangers of smoking.
	The Concept of Disease	At the end of this activity, students should be able to define disease, describe different types of diseases and characterise diseases caused by environmental factors.
	Bacterial Diseases	At the end of this activity, students should be able to present examples of the mechanism of bacterial virulence, explain Koch's principles name the routes of transmission of salmonellosis, tuberculosis and cholera, and describe basic antiseptic procedures and the treatment of bacterial infections.

CHAPTER	LESSON	DESCRIPTION
	Parasitic Diseases	At the end of this activity, students should be able to present examples of the mechanisms of parasite pathogenicity, discuss the routes of infection and means of preventing parasitic diseases and discuss the life cycles of Plasmodium, Ascaris, and Schistosoma.
	AIDS – an Example of a Viral Disease	At the end of this activity, students should be able to: define HIV and AIDS, discuss the life cycle of the virus, and present preventive measures against HIV infection.
	Human Immunity	At the end of this activity, students should be able to: describe the events that occur during an immune response, define antigens and antibodies, name the types of immune cells and describe their function, compare and contrast innate and acquired responses, describe and define the importance of immune memory and describe passive and active immunization with examples.
	Coronary Heart Disease	At the end of this activity, students should be able to: describe the processes involved in atherosclerosis, coronary heart disease and myocardial infarction, define coronary heart disease and ischaemia, and describe the measures for preventing coronary heart disease and briefly describe the methods of treatment.
	Cancer	At the end of this activity, students should be able to: define malignant and benign neoplasms, name and discuss the stages of neoplasm development, discuss the factors responsible for neoplasms and give examples of preventive measures we can take to reduce the risk of developing cancer, and discuss anti-neoplasm mechanisms existing in the organism and methods of cancer treatment.
	Actions of Different Groups of Medicines	At the end of this activity, students should be able to discuss the action of antibiotics and beta-blockers, and name the methods for obtaining monoclonal antibodies and give examples of their use as drugs.
XIV. Genetic Information	**DNA – the Carrier of Genetic Material**	At the end of this activity, students should be able to demonstrate that DNA is the carrier of genetic material located in the cell nucleus, present the chemical and spatial structure of DNA and define replication, explain the semi-conservative nature of replication and describe the process of replication.
	Organization of DNA in Chromosomes	At the end of this activity, students should be able to present the levels of DNA organization from double helix to metaphase chromosome, explain the role of histones in the spatial structure of DNA, present the morphology of metaphase chromosome, define homologous chromosomes, autosomes and heterosomes, describe a karyotype and the principles of its preparation and explain the terms locus, allele, homozygote and heterozygote.
	Cloning of Organisms	At the end of this activity, students should be able to define a clone and explain what cloning involves, describe the methods of plant cloning, including micropropagation, describe the stages in the cloning of an animal organism and explain the concepts of reproductive cloning and therapeutic cloning.
	Genetic Code and Protein Synthesis	At the end of this activity, students should be able to describe the structure of RNA, its types and the site of location in the cell, explain the connection between DNA and proteins, and explain the notion of translation and describe its course.
	Mutations	At the end of this activity, students should be able to define a mutation, describe the types of gene mutations and their possible consequences, describe the effects of certain physical and chemical mutagens on DNA, and explain the role of suppressor genes and oncogenes in the development of neoplasms.

CHAPTER	LESSON	DESCRIPTION
	Chromosomal Mutations	At the end of this activity, students should be able to define a chromosomal aberration and present the types of chromosomal mutations and present examples of the chromosomal aberrations that most often occur in humans.
XV. Genetic Engineering	**Genetic Engineering Techniques**	At the end of this activity, students should be able to define genetic engineering, discuss the basic techniques of genetic engineering and indicate applications of genetic engineering.
	Medical Applications of Genetic Engineering	At the end of this activity, students should be able to explain the role of genetic engineering in medicine, discuss the basic genetic engineering techniques used in medicine and indicate the applications of genetic engineering in forensic medicine and diagnostics.
	Transgenic Organisms	At the end of this activity, students should be able to define a transgenic organism, describe the process of creating a transgenic organisms and give examples of genetic modifications.
XVI. Genetics According to Mendel	**Inheritance of a Single Trait**	At the end of this activity, students should be able to present the importance of Mendel's research for genetics, explain Mendel's law of dominance, discuss Mendel's first law of segregation, define homozygote, heterozygote, phenotype and genotype, apply modern knowledge to explain Mendel's first law, construct a Punnett square and present the mechanism of inheritance of Huntington's chorea and cystic fibrosis.
	Inheritance of Two or More Traits	At the end of this activity, students should be able to explain the term co-dominance, give examples of co-dominance (inheritance of blood groups and sickle-cell anaemia), demonstrate the functioning of multiple alleles, explain the term epistasis, draw a genetic diagram for a dihybrid cross and quote Mendel's second law.
	Inheritance of Sex	At the end of this activity, students should be able to explain the term sex chromosomes, present the mechanism of inheritance of sex hormones in human, define linked traits, present the mechanism of inheritance of linked traits, present the mechanism of inheritance of sex-linked illnesses: haemophilia and colour blindness, present the mechanism of inheritance of sex-linked traits and explain the cause of baldness.
XVII. Variation in Organisms	**The Nature of Variation**	At the end of this activity, students should be able to explain what individual variation involves, describe the basic types of distribution of trait variation, differentiate between discontinuous variation and continuous variation of traits, understand the biological significance of trait variation and understand the reasons for the vast range of possible combinations of traits and the uniqueness of individual traits.
	Factors Influencing Variation	At the end of this activity, students should be able to name the main factors influencing variation of traits, differentiate between inherited variation and non-inherited variation, explain the relationship between phenotypic traits, genotype (the genetic record of traits) and the modifying effects of environmental factors, explain the biological significance of variation and explain the reasons for the vast range of possible combinations of traits and the uniqueness of an individual's traits.
	Elements of Population Genetics	At the end of this activity, students should be able to indicate the main factors that affect the frequency of traits in populations, understand the association between the factors that affect a population and evolution and explain the reasons for the vast range of possible trait combinations and the uniqueness of individual traits.
	Speciation – the Formation of Species	At the end of this activity, students should be able to indicate the main factors that affect the formation of species, understand the association between factors that affect a population and the process of speciation and understand the processes of reproductive isolation that determine the identity of a species.

CHAPTER	LESSON	DESCRIPTION
	Different Modes of Speciation	At the end of this activity, students should be able to indicate the main factors that influence the formation of species, understand the range of factors that affect speciation in a population and understand the factors that lead to reproductive isolation and determine the formation of species.
XVIII. Population	**Features of Populations**	At the end of this activity, students should be able to name the main features of populations, recognize the changeability of population features and understand the reasons for the vast range of possible trait combinations and the uniqueness of population traits.
	Biodiversity	At the end of this activity, students should be able to recognize the significance of biodiversity for the existence of nature and humankind, recognize that human activities can damage biodiversity, understand the association between the quality of human life and the degree of biodiversity, understand the principle of conserving biodiversity by the protection of entire ecosystems and understand the need to protect endangered species.
	The Ecosystem – an Organized and Functional Unit of the Natural Environment	At the end of this activity, students should be able to recognize the ecosystem as an organized and functional unit, recognize the multiplicity of interactions that constitute an ecosystem, understand why ecosystems need to be self-maintaining and understand why it is necessary to preserve entire ecosystems in order to maintain the balance of nature.
	Energy Flow and the Circulation of Matter	At the end of this activity, students should be able to recognize the complex associations between the species in a single ecosystem, recognize the multiplicity of pathways of energy flow and matter circulation in an ecosystem, understand the one-way nature of energy flow through the environment and the cyclical nature of the flow of matter through the environment and understand how the balance of matter and energy in the natural environment can be interpreted in economic terms.
	Ecological Succession	At the end of this activity, students should be able to recognize changes in ecosystems over time, recognize the multiplicity of interactions that make up the process of succession, assess the effects of human activities on the course of succession in different ecosystems and understand the causes of changes that take place in ecosystems over time.
	Effects of Human Activity on Ecosystems	At the end of this activity, students should be able to recognize the effects of human actions on nature as an organized and functional system, recognize the extent of changes induced by humans in ecosystems, understand the association between the quality of human life and the degree of the conservation of nature as an organized and functional system, understand the need for long-term planning and careful management of the exploitation and transformation of ecosystems and understand the need for ecosystem conservation and for the restoration of ecosystems destroyed by human actions.
	Agriculture – the Conservation of Biodiversity	At the end of this activity, students should be able to recognize the effects of agriculture on environmental resources and the natural environment, understand the relationship between agriculture and environmental resources and factors, understand why macroeconomic plans and calculations should take into account the effects of agriculture on the natural environment, understand the need to conserve biodiversity by agriculture and forestry practice and understand the principle of conserving biodiversity by the protection of entire ecosystems.