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	No. of Digital Lessons		No. of ePages	Films & Animations	Simulations Games & 3D objects	Illustrations	Photos & Slideshows
Upper Primary	Mathematics	127	1 099	700	473	876	69
	Science	80	635	489	210	1 288	313
Lower Secondary	Mathematics	136	1 320	897	609	320	103
	Physics	111	970	746	352	874	528
	Biology	101	903	413	144	655	1 171
	Chemistry	99	821	1 058	175	525	1 118
Upper Secondary	Mathematics	112	1 077	675	470	419	204
	Physics	119	1 055	928	393	902	465
	Biology	99	977	487	107	699	615
	Chemistry	100	889	1 354	303	1 176	304
	TOTAL	**1 084**	**9 746**	**7 747**	**3 236**	**7 674**	**4 891**

CONTENTS OF THIS SECONDARY BIOLOGY PACKAGE

CHAPTER	LESSON	DESCRIPTION
I. Life Processes and Cell Functions	**Animal and Plant Cells**	This lesson explores the similarities and differences between animal and plant cells. Students will learn about the cell membrane, cytoplasm, and nucleus in both animal and plant cells. They will also explore the functions of chloroplasts and cell walls in plant cells and specialized animal cells. The lesson also details levels of organization, including the way animal and plant cells form tissues, tissues form organs, and organ systems form the complex levels of organization in the human body.
	Human Organ Systems	This lesson describes key functions of the human organ systems. Students will learn major organs that belong to each system and functions of specific organs.
	Life Processes	Description: This lesson details seven life processes required by living organisms: respiration, nutrition, excretion, growth, sensitivity, movement, and reproduction. Students learn how these life processes distinguish living things from non-living things.
	Specialized Cells	This lesson describes ways in which cells are specially adapted to their functions. Students will explore examples of specialized cells in both animals and plants. They will also learn some of the features of the red blood cell, cilia cell, sperm cell, and other specialized cells.
	Structure of Flowering Plants	This lesson describes the four main plant organs: the stem, leaves, roots, and flower. Students will learn that the male sex cells, called pollen grains, fertilize female sex cells, called ova. They will also learn ways in which seeds develop after fertilization and are dispersed by plants.
II. Humans as Organisms	**Absorption and Waste**	This lesson describes how the products of digestion are absorbed into the bloodstream and transported throughout the body. Students will learn the role of the kidneys in the removal of waste as well as the process of solid waste remove in humans.
	Adolescence	This lesson describes physical and emotional changes that occur during puberty. Students will learn some of the key changes take place in girls and boys during adolescence.
	Breathing	This lesson discusses the role of lung structure in gas exchange. Students will learn the role of the lungs and the structure of the lungs. They will also learn about the mechanism of breathing and the differences between inhaled and exhaled air.
	Development of the Fetus	This lesson describes the development of a baby from cell division to birth. Students will learn about implantation, the role of the placenta, the stages of development of the fetus, and the stages of birth.
	Digestion	This lesson outlines the principles of digestion, including the role of enzymes in breaking large molecules into smaller ones. Students will learn how food is used as fuel during respiration to maintain the body's activity and as a raw material for growth and repair. They will also learn how to describe the role of the main organs of the human digestive system.
	Drugs and Health	In this lesson, students will learn the main types of legal and illegal drugs. Students will review the dangers of the most commonly abused drugs, and consider how drug abuse can affect human health.
	Fighting Disease	This lesson describes how the growth and reproduction of bacteria and the replication of viruses can affect human health. Students will learn how the body's natural defenses can be enhanced by immunization and medications.

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	Human Reproduction	This lesson covers the male and female reproductive systems. Students will learn about the human sex organs, about the stages of the menstrual cycle, and about how fertilization takes place in humans.
	Human Respiration	This lesson describes the difference between the two types of respiration: aerobic respiration and anaerobic respiration. Students will learn how to summarize aerobic respiration and anaerobic respiration in word equations. They will also learn how substances involved in respiration are transported through the bloodstream and how energy is obtained from respiration.
	Nutrition	This lesson defines a balanced diet and provides examples of good sources of carbohydrates, proteins, fats, vitamins, minerals, and fiber. Students will learn the importance of each of these nutrients, as well as how vital water is to human health.
	Smoking	This lesson covers the effects of smoking on the human body. Students will learn about the chemicals found in cigarette smoke and the health problems associated with them. They will also learn how smoking affects a fetus.
	The Skeleton and Movement	This lesson describes the role of the skeleton and joints. Students will learn the principle of antagonistic muscle pairs and how movement is produced in the body.
III. Green Plants as Organisms	**Factors Affecting Photosynthesis**	This lesson explores factors that affect photosynthesis, including light, water, temperature, and carbon dioxide. Students will learn about the importance of these factors as well as how to test for them.
	Photosynthesis and Food Production	This lesson explains the important role of plants as food and as oxygen producers. Students will learn about photosynthesis, including what plants need for photosynthesis and how the process can be summed up in an equation.
	Plant Growth	This lesson details what plants need to be healthy, including the minerals nitrates, phosphates, and potassium. Students will learn the role of roots and root hairs in absorbing water and minerals from the soil. They will also learn how nutrients can be added to soil that lacks them.
	Respiration in Plants	In this lesson, students will learn the importance of the products of plant respiration and the key role of water in a plant's life processes. The lesson describes aerobic respiration in plants, including the word equation for plant respiration. It also describes how photosynthesis and respiration are related.
IV. Variation, Classification, and Inheritance	**Causes of Variation**	This lesson explores environmental and inherited causes of variation. Students will learn examples of human variation that can be attributed to genetic and to environmental factors. They will also learn the main causes of variation in plants.
	Classification	In this lesson, students will learn how to classify organisms into taxonomic groups. They will also learn examples of organisms from each taxonomic group.
	Inheritance	This lesson defines inherited characteristics and explains the role genes play in inheritance. Students will explore several examples of inherited characteristics, as well as the usefulness of selective and cross-breeding techniques.
	Variation	The lesson defines the term species, and explores the nature of variation between organisms. Students will learn about variation between species and within a species, including human variation. They will also learn the difference between continuous and discontinuous variation.

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	Properties of Non-Metals	In this lesson students will learn how to describe the appearance, state at room temperature, magnetic properties, and thermal and electric conductivity of non-metals. They will also learn other properties of non-metals, such as strength and density.
	Separating Mixtures	This lesson explores several ways in which mixtures can be separated into their parts. Students will learn how distillation, filtration, evaporation, and chromatography can be used to separate different types of mixtures.
	Solids, Liquids, and Gases	This lesson explores the states of matter of solids, liquids, and gases. Students analyze the properties of each state, and learn how the particle theory explains the differences between the states. They also observe experiments to learn what happens when substances change from one state of matter to another.
VII. Changing Materials	**Chemical Reactions**	This lesson focuses on the roles of reactants and products in a chemical reaction. Students will learn that virtually all materials, including those in living systems, are formed by chemical reactions. They will also explore several different types of chemical reaction, and learn how some chemical reactions are useful to humans and others are harmful.
	Geological Changes	This lesson describes three ways in which the weathering of rock takes place: physical, chemical, and biological. Students will learn how the forces generated by expansion, contraction, and the freezing of water can cause weathering. They will also learn how gases dissolved in precipitation can break down rocks. Then they will see examples of how plants and animals can cause weathering, and learn the types of materials that make up soil.
	Physical Changes in Materials	This lesson describes how mass is conserved when physical changes take place. Students learn how a material's temperature changes as it is heated or cooled enough to melt, boil, condense, or freeze. Students will also learn what energy transfers occur during changes of state and how materials expand and contract as they change temperature.
	Rock Formation	In this lesson students will learn the processes by which igneous, sedimentary, and metamorphic rocks are formed. They will see how the mode of rock formation affects the texture and mineral content of the rock. They will also learn characteristics and examples of each type of rock. The lesson ends with a discussion of how rocks are commonly used for building and other purposes.
	Solutions	This lesson details what happens when one substance dissolves in another. Students will learn how solubility varies with temperature, what a saturated solution is, and the differences between the solubility of solutes in different solvents. They will also learn how solvents and solutes are used in everyday life.
	The Effects of Combustion	This lesson describes how fossil fuels form. Students will learn the effects of fossil fuels on the environment, including global warming and acid precipitation. They will also see how the amount of pollution from combustion can be reduced.
VIII. Patterns of Behavior	**Acid Reactions**	This lesson explains how acids react with metals, bases, and carbonates, and describes the products of these reactions. Students will also learn how acids can corrode metal and cause the chemical weathering of rocks.
	Acids and Bases	This lesson describes the properties of acids and bases. Students will learn how to use indicators and the pH scale to classify solutions as acidic, basic, or neutral. They will also learn everyday examples of acids and bases.
	Displacement Reactions	This lesson explains displacement reactions. Students will learn examples of displacement reactions between metals and solutions of a salt or another metal. They will also learn the order of metals in the reactivity series and how metals are extracted from their ores.

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	Neutralization	This lesson explains the process of neutralization. Students will learn how to make salts using a neutralization reaction and some everyday applications of neutralization.
	The Reactivity of Metals	This lesson describes the reactivity of metals with oxygen, water, and acids. Students will learn that substances are produced by these reactions. They will also learn how to name the products of these reactions.
IX. Electricity	**Electric Current**	This lesson explores how the current in a circuit depends on the number of cells and the number and nature of other components. Students will learn that current is not 'used up' by components. They will also see that the resistance of wires depends upon their material, length, and thickness.
	Electrical Circuits	This lesson begins by describing the source of static electricity. Then students learn how to measure current and voltage. They also explore how energy is transferred from batteries and other sources to the components in electric circuits. Students demonstrate their understanding by interpreting and drawing electric circuit diagrams.
	Electromagnets	This lesson describes how an electric current in a wire produces a magnetic field. Students will learn how electromagnets are constructed, and what factors affect their strength. They will also learn some uses of electromagnets, including electric bells, relay switches, and appliances.
	Magnets	In this lesson, students will learn what it means for an object to be magnetic. They will explore magnetic fields and how they affect magnetic materials. Students will also explore how magnets interact with each other.
	Series and Parallel Circuits	This lesson details how to design and construct series and parallel circuits. As students analyze and build circuits, they learn how current flows in different types of circuits and what causes a short circuit.
X. Forces and Motion	**Balanced and Unbalanced Forces**	In this lesson, students will learn how unbalanced forces change the speed or direction of motion of objects. They will also see that balanced forces do not cause a change in the motion of an object. Students will explore several examples of these balanced and unbalanced forces in action.
	Force and Rotation	This lesson shows how levers can make work easier. Students learn how forces cause objects to turn around the pivot of a lever. They then learn the three basic types of levers, how to draw force arrows on diagrams that show how levers work, and everyday examples of levers.
	Friction	This lesson describes how frictional forces such as air resistance affect motion. Students will learn how the balance between frictional forces affects the movement and direction of an object. They will explore the concepts using specific examples.
	Pressure	This lesson explores the concept of pressure. Students will learn the quantitative relationship between force, area, and pressure. They will then learn how to solve problems for force, area, or pressure. In addition, they will learn applications of increased and decreased pressure.
	Speed	This lesson describes how to determine the speed of a moving object. Students will learn how to use the triangular relationship between speed, distance, and time to solve problems. They will also learn units of speed and how to show speed data in graphical form.

CHAPTER	LESSON	DESCRIPTION
	Torque	This lesson introduces the principle of torque. Students will learn how to measure torque and balance torques. Advanced students will find opportunities for calculating torque.
	Weight	In this lesson, students will learn the difference between weight and mass. They will see how the weight of an object results from the gravitational attraction between the object and the Earth. Students will learn how to measure mass and weight. They will also explore how the weight of an object depends on its mass, the mass of the Earth, and how far the object is from the center of the Earth.
XI. Light and Sound	**Color**	This lesson describes how white light can be dispersed to give a range of colors. Students will learn how colored filters affect white light. They will also learn how to describe the appearance of colored objects in white light and other colors of light.
	Hearing	This lesson explains how sound travels and how sound is caused by vibration. Students will learn how sound causes the ear drum to vibrate and why different people have different audible ranges. They will also learn the effects of loud sounds on the ear.
	Light	In this lesson, students will learn that light traveling in a uniform medium moves in a straight line at a finite speed. They will observe the difference between opaque and transparent objects. They will also see what happens during eclipses of the sun and moon. They will learn the difference between the speed of light and sound, and consider how that difference affects our perception of events. They will also explore how we see objects.
	Reflection	This lesson helps students understand how mirrors work and how they are used. Students will learn what path light follows when it is reflected and how a periscope works. They will also learn to draw a reflection diagram, and describe how light is reflected off different types of surfaces.
	Refraction	This lesson explains that light travels at different speeds in different materials, depending on the density of the materials. Students will learn the principle of refraction: how a light ray bends when it passes from one medium to another. They will explore several examples of refraction and learn how to draw a refraction diagram.
	Sound	This lesson compares the ways in which sound and light travel, including their speeds. Students will learn how to explain the relationship between the loudness of a sound and the amplitude of the vibration causing it. They will also explain the relationship between the pitch of a sound and the frequency of vibration causing it.
XII. The Earth and Beyond	**Satellites**	This lesson focuses on satellites. Students will learn about the moon and other natural satellites of planets. Then they will explore artificial satellites and probes to learn about their various purposes and processes, including weather monitoring, communication and navigation, observation of the Earth, and observation of outer space.
	The Night Sky	This lesson explains why the sun and other stars are light sources. Students will learn how the planets and other bodies can be seen by reflected light in the night sky. They will also become familiar with some of the major constellations and the Horsehead Nebula.
	The Rotating Earth	This lesson describes how the movement of the Earth causes the apparent daily movement of the sun and stars. Students will learn how long it takes the Earth to orbit the sun. They will also explain the phenomena of the seasons.
	The Solar System	In this lesson students will learn how to describe the relative positions of the Earth, sun, and planets in the solar system. They will describe the movements of the planets around the sun and relate these to gravitational force. They will also learn to explain how the movement of the earth causes the apparent movement of other bodies.

CHAPTER	LESSON	DESCRIPTION
XIII. Energy Resources and Energy Transfer	**Energy Conservation**	This lesson explains what is meant by the conservation of energy. Students will learn how energy is always conserved, and how energy can be given out as useful energy and wasted energy.
	Energy Resources	This lesson covers different forms of energy resources. Students will learn how to describe a variety of energy resources, and classify them as renewable or non-renewable. They will also learn how to compare the strengths and weaknesses of different energy resources.
	Generating Electricity	This lesson describes how electricity is generated. Students will learn the differences between renewable and non-renewable energy sources in terms of electricity generation.
	Heat and Temperature	This lesson describes the difference between temperature and heat. Students will learn how differences in temperature can lead to the transfer of energy.
	The Sun's Energy	This lesson describes the sun's role as the ultimate source of most of the Earth's energy. Students will learn the sun's role in the formation of fossil fuels and explain how the sun's energy is transferred to renewable energy resources.
	Transfer of Energy	In this lesson, students will learn how energy can be transferred and stored. They will be able to describe how heat energy is transferred directly by radiation and indirectly by conduction, convection, and evaporation.

CHAPTER	LESSON	DESCRIPTION
I. The Cell – the Basic Unit of Living Organisms	**Structure of Plant and Animal Cells**	At the end of this activity, students should be able to describe the basic organization of the cell and compare and contrast animal and plant cells.
	Microscopes and the Size of Cells	At the end of this activity, students should be able to describe a light microscope, describe the concept of electron microscope design, compare and contrast light and electron microscopes, define the basic units of measurement applicable to microscopic studies and prepare samples for examination under a light microscope.
	Chemical Composition of Cells	At the end of this activity, students should be able to have a basic understanding of the chemical composition of a cell, know the structure and function of proteins, lipids and carbohydrates, and be able to define the role that each of the molecules plays in the metabolic processes within a cell and a multicellular organism.
	The Nucleus as a Store of Genetic Material	At the end of this activity, students should be able to describe the structure of chromosomes, define haploid and diploid sets of chromosomes, define homologous chromosomes, and define changes in the amount of genetic material during cell cycle.
	Cell Division	At the end of this activity, students should be able to describe and compare mitosis and meiosis and define the importance of mitosis and meiosis.
	Cell Specialization	At the end of this activity, students should be able to define the levels of organization existing in the living world and associate the components of the cell with their function in particular cells.
	Transport Across Membranes	At the end of this activity, students should be able to define diffusion, osmosis and active transport, compare and contrast diffusion, osmosis and active transport, describe examples of diffusion, osmosis and active transport in animals and plants, and discuss the significance of each kind of transport in living organisms.
	Metabolic Transformations in a Cell	At the end of this activity, students should be able to define metabolism, explain the differences between anabolic and catabolic reactions, explain the role of ATP, define the role of enzymes, explain the term "active site" and present a diagram of a reaction with an enzyme, explain the terms "cofactor" and "inhibitor" and their influence on the progress of enzymatic reactions, and demonstrate the influence of temperature on the rate of enzymatic reactions.
	Plant Tissues	At the end of this activity, students should be able to distinguish meristems from true tissues, define the functions and distribution of meristems in plants, and define the structure and functions of true primary and true secondary tissues.
	Animal Tissues	At the end of this activity, students should be able to describe the features of the cells constituting basic animal tissues and define the functions of the main animal tissues.
II. The Diversity of Living Organisms	**Classification of Organisms**	At the end of this activity, students should be able to recognize the need for organizing information about species, understand the principles of classification of species according to their specific features, and understand the reasons for the differences between systems of classification of living creatures.
	Prokaryotes, Protists and Fungi	At the end of this activity, students should be able to name the basic features of prokaryotes and eukaryotes, name the basic features of protists and differentiate between the basic groups of protists, and name the basic features of fungi and lichens.

CHAPTER	LESSON	DESCRIPTION
	Plants	At the end of this activity, students should be able to name the basic characteristics of plants, distinguish the basic groups of plants, recognize how plants adapt to terrestrial conditions, and recognize the diversity of plant forms.
	Invertebrates	At the end of this activity, students should be able to recognize the variety of adaptations among the groups of invertebrates, indicate the features that are characteristic for each group of invertebrates, assign animals to a specific group of invertebrates, recognize similarities in structure and function in selected representatives of the groups of invertebrates, and recognize the differences in structure and function in selected representatives of the groups of invertebrates.
	Reproduction in Invertebrates	At the end of this activity, students should be able to describe the diversity of reproductive methods and adaptations in invertebrates and describe the similarities and the differences in the structure and function of the reproductive organs and systems of selected examples from given classes of invertebrates.
	Vertebrates	At the end of this activity, students should be able to describe the variety of adaptations among the classes of vertebrates, indicate the features of selected animals that are characteristic of the class of invertebrates to which they belong, and describe the similarities and differences in structure and function of selected examples of the classes of vertebrates.
	Reproduction in Vertebrates	At the end of this activity, students should be able to recognize the different reproductive adaptations among classes of vertebrates, recognize the differences in the structure and function of the egg among classes of vertebrates, recognize the adaptations that enable the embryos of reptiles, birds and mammals to become independent from the aquatic environment, recognize how parents participate in the postembryonic development of their offspring, especially in birds and mammals, and recognize the similarities between representatives of classes of vertebrates in regard to the development of the embryo inside the mother's body.
	Viruses	At the end of this activity, students should be able to describe the basic characteristics of viruses, describe the main differences between viruses and cell organisms, describe the structure of a virus, name the stages and events in the viral multiplication cycle, recognize human diseases caused by viruses, and understand how viruses affect a host cell.
III. Circulation	**Blood**	At the end of this activity, students should be able to describe the structure of blood, describe the chemical composition of plasma, describe the structure and function of blood cells, explain the process of blood clotting, and explain how the transport of respiratory gases occurs.
	Blood Vessels	At the end of this activity, students should be able to describe the structure of arteries, veins and capillaries, define the functions of arteries, veins and capillaries, and explain how components are exchanged between blood and tissue fluid.
	Blood Groups and the Rh Factor	At the end of this activity, students should be able to determine human blood groups, explain what Rh factor is, present the possibility of transfusion in the ABO and Rh systems, explain what serological incompatibility involves, and give examples of medical application of blood.
	The Circulatory System	At the end of this activity, students should be able to define the location of the heart in the human organism, describe cardiac muscle tissue, discuss the structure of the heart, describe the cardiac cycle, explain the importance of the coronary circulation, describe the pulmonary circulation, and describe the systemic circulation.

CHAPTER	LESSON	DESCRIPTION
	Effects of Physical Effort on the Functioning of the Circulatory System	At the end of this activity, students should be able to the influence of physical effort on blood, vessels and the heart, and the response of blood vessels and the heart to physical effort the most common ways of prevention of cardiovascular diseases.
	Risk Factors for Heart Attack	At the end of this activity, students should be able to define the process of atherosclerosis, arterial hypertension, and the related cardiovascular diseases, describe the most common ways of preventing cardiovascular diseases, and describe cardiopulmonary resuscitation.
IV. Nutrition	**Nutrients**	At the end of this activity, students should be able to describe the importance of the organic constituents of food: proteins, fats, carbohydrates, vitamins and fibre, describe the importance of water and mineral ions, indicate the sources of nutrients, explain the factors affecting nutritional requirements, describe the effects of nutrient deficiencies, and give examples of the use of preservatives and colourings in foods.
	The Human Digestive System	At the end of this activity, students should be able to present the structure of the human alimentary canal, show the relationship between the structure and functions of each section of the alimentary canal and explain the structural and functional connection between the liver and pancreas and the alimentary canal.
	Digestion	At the end of this activity, students should be able to define digestion, explain how digestive enzymes work, describe the digestion of carbohydrates, proteins, fats, define the site of the absorption of digestion products, describe the role of bile in lipids digestion, and define the role of symbiotic bacteria in vitamins production.
	Absorption	At the end of this activity, students should be able to describe the adaptations of the intestine for the absorption of the products of digestion, describe the absorption of the products of protein, carbohydrate and lipid digestion, indicate the association between the circulatory system and alimentary canal, describe the role of the liver in the regulation of glucose levels, and describe the role of the liver in detoxification.
V. Respiration	**Cellular Respiration and Energy Production**	At the end of this activity, students should be able to know the structure of the respiratory system, know the course of gas exchange in the lungs. explain that respiration involves the release of energy from organic compounds, differentiate between the two types of respiration: aerobic and anaerobic, indicate the type of respiration that releases the most energy, explain the circumstances in which anaerobic respiration occurs in human beings, and explain the meaning of the term "oxygen debt".
	The Respiratory System	At the end of this activity, students should be able to describe the structure of the respiratory system, explain the mechanism of breathing, compare the composition of inhaled and exhaled air, explain what is involved in gas exchange in the lungs, and name the adaptations of the lungs to gas exchange.
VI. Nervous System	**The Nervous System as a Receptor of Environmental Stimuli**	At the end of this activity, students should be able to specify the main types of stimuli received by the nervous system, describe a neurone and the basic types of neurons, define the basic elements of the nervous system involved in producing the appropriate response to a stimulus, characterize the structure and function of a synapse, and define a neurotransmitter.
	Nervous System	At the end of this activity, students should be able to name the parts of the nervous system and their structures, describe the basic functions of particular parts of the nervous system, define the terms "nerve centre" and "nerve", and name the most important structures protecting the nervous system.

CHAPTER	LESSON	DESCRIPTION
	The Peripheral Nervous System	At the end of this activity, students should be able to describe the hierarchy in the peripheral nervous system (PNS), define and describe the divisions of the autonomic nervous system (ANS), and explain the opposing (antagonistic) actions within the PNS, its motor system and the ANS.
	Reflex Responses of the Nervous System	At the end of this activity, students should be able to differentiate between voluntary and involuntary responses, define conditioned and unconditioned reflexes, and describe Pavlov's experiments.
	Sensory Organs	At the end of this activity, students should be able to describe the three types of receptors, define the role of receptors in the body, and describe the structure and function of the organs of taste and smell.
	The Eye and the Ear	At the end of this activity, students should be able to know the tissue structure, know the mechanisms of the generation of nerve impulses and the principles of their operation, know the structure and function of receptors in the nervous system, describe the structure of the eye and ear the sensory organs of hearing and balance, and define the functions of the eye and ear.
VII. Hormones	**Hormones and Endocrine Glands**	At the end of this activity, students should be able to define a hormone, name the endocrine glands and define their location in the human organism, name the hormones released by certain glands, present examples of hormone activity in the human organism, explain what is involved in the regulation of hormone secretion, and define the dominant role of the pituitary gland in the endocrine system.
	Hormonal Regulation of Metabolic Processes	At the end of this activity, students should be able to explain how blood sugar level is regulated, describe the action of adrenaline, present the action of growth hormone, and explain the role of thyroid hormones.
	Sex Hormones	At the end of this activity, students should be able to define the effects of sex hormones on the development of the secondary sex characteristics, explain how hormones regulate the menstrual cycle, and give examples of the applications of hormones.
VIII. Human Locomotion System	**Skeletal Muscles**	At the end of this activity, students should be able to describe the external structure of skeletal muscles, describe the structure of the skeletal muscle cell, explain the terms: muscle fiber, myofibril, myofilament, sarcomere and neuromuscular junction, explain the sliding filament theory, and explain the antagonistic activity of muscles.
	The Skeletal System	At the end of this activity, students should be able to explain what is involved in the process of bone remodelling, describe the morphological structure of a long bone, name the components of the axial and appendicular skeletons, define joint, explain its role and name its main components, and name the functions of the human skeletal system.
IX. Homeostasis	**Homeostasis**	At the end of this activity, students should be able to explain the terms relating to the internal environment of the organism and homeostasis, explain the roles of the nervous and endocrine systems in homeostasis and the interdependence of these systems, explain the mechanisms of negative and positive feedback, and present an example of a homeostatic mechanism (regulation of glucose concentration in the blood).
	The Role of the Kidneys	At the end of this activity, students should be able to define excretion, discuss the structure of the nephron, describe the stages of urine formation – glomerular filtration, and tubular secretion, explain the role of ADH in the regulation of water excretion, and explain how an artificial kidney works and the importance of kidney transplantation to people with renal failure.

CHAPTER	LESSON	DESCRIPTION
	Thermoregulation	At the end of this activity, students should be able to distinguish between endothermic and exothermic organisms, define homoiothermy, explain the importance of homoiothermy for the human organism, describe the basic methods used by the organism thermoregulation process, present elements of the thermoregulatory system and indicate the role of the nervous system in thermoregulation, and present the mechanism of negative feedback in thermoregulation.
X. Human Reproduction	**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 labor.
	The Reproductive System	At the end of this activity, students should be able to present the structure of the male reproductive system, define the functions of specific organs of the male reproductive system, present the structure of the female reproductive system, define the functions of specific organs of the female reproductive system, describe spermatogenesis, present the structure of sperm cells, describe oogenesis, and present the structure of egg cells.
XI. Health and Diseases	**The Human Immune System**	At the end of this activity, students should be able to define antigen, antibody, immunity, specific and non-specific immunity, cellular and humoral immunity, name the components of the immune system, describe the role of phagocytes and lymphocytes in the immune response, and describe an inflammatory response – characterize primary and secondary immune responses.
	Vaccinations	At the end of this activity, students should be able to define the terms "epidemic" and "pandemic", give examples of epidemic chains and methods of breaking them, describe the significance of the discoveries by Jenner and Pasteur in the development of vaccinations, explain how active immunity is produced by vaccination, state the difference between preventive vaccination and therapeutic vaccination, explain the significance of vaccinations in the fight against infectious diseases, and justify the need for the administration of preventive vaccinations.
	Bacterial Diseases	At the end of this activity, students should be able to describe the most important concepts of medical microbiology, describe how people become infected with the Mycobacterium tuberculosis Salmonella typhi, Vibrio cholerae, Yersinia pestis and Treponema pallidum, describe the most important risks associated with the diseases caused by these bacteria, present the most important methods for avoiding infections with these bacteria, and give reasons for the introduction of public health regulations in order to combat infectious diseases.
	Viral Diseases	At the end of this activity, students should be able to name several viral diseases (influenza, poliomyelitis, rubella, measles, mumps, chickenpox), explain why one person can contract influenza several times, explain why bird flu viruses are so dangerous to human beings, briefly describe the characteristics of childhood diseases (rubella, measles, mumps, chickenpox) and their complications, describe the possible complications of viral hepatitis B and C, and describe the role of vaccinations in the prevention of viral diseases, including poliomyelitis.
	Human Immunodeficiency Virus (HIV)	At the end of this activity, students should be able to explain the abbreviations HIV and AIDS, describe the structure of HIV, describe the life cycle of HIV, explain how HIV affects the functioning of the immune system, describe the process of HIV infection, give examples of high-risk behaviors, explain how HIV can be easily destroyed by means of common disinfectants and high temperature, and comprehend that people infected with HIV can lead a normal life in society.
	Antiseptics and Antibiotics	At the end of this activity, students should be able to give the definitions of antibiotics, antiseptics, antisepsis, describe the action of penicillin, and describe the idea and importance of antibiotic resistance in bacteria.

CHAPTER	LESSON	DESCRIPTION
	Parasitic Diseases	At the end of this activity, students should be able to explain what parasitism involves, present the life cycles of selected human parasites, explain the pathological effect of parasites, and present ways to prevent parasitic infections.
	Effects of Drugs, Cigarettes and Alcohol	At the end of this activity, students should be able to define dependence and present its examples, describe the effects of basic drug types on the nervous system, define addiction, give examples of addictions, describe the effects of cigarettes on the organism and name diseases caused by smoking, and describe the effects of alcohol on the organism and name diseases caused by drinking.
XII. Plant Nutrition	**Photosynthesis**	At the end of this activity, students should be able to write the equation for photosynthesis, describe the course of the light phase and the dark phase of photosynthesis, describe how temperature, light and carbon dioxide levels affect the rate of photosynthesis, describe the relationship between photosynthesis and respiration, and explain the importance of photosynthesis.
	Mineral Nutrition in Plants	At the end of this activity, students should be able to define macro-elements, trace elements and ultra-trace elements, describe the importance of macro-elements for optimum plant growth and development, and present the importance of inorganic fertilizers.
	Crop Production	At the end of this activity, students should be able to explain how soil pH affects the growth of plants, name the types of fertilizers, name the methods for combating weeds, describe methods for protecting plants from diseases, present the advantages of greenhouses for plant cultivation, and describe the principle of hydroponic cultivation.
	Carnivorous Plants	At the end of this activity, students should be able to define the significance of carnivorousness, describe how plants capture animals, give named examples of carnivorous plants, and indicate the distribution of selected carnivorous plants.
XIII. Plant Reproduction	**Plant Reproduction**	At the end of this activity, students should be able to describe the mode of reproduction in spore-bearing plants, compare the life cycles of mosses and ferns, describe the life cycle of gymnosperms, and describe the reproductive organs and life cycle of angiosperms.
	Seed Germination and Plant Growth	At the end of this activity, students should be able to describe the structural components of a seed and their roles, describe the chemical composition of different seeds, describe the process of germination, and define the environmental factors necessary for germination.
XIV. Transport in Plants and Plant Movements	**Water Transport in Plants**	At the end of this activity, students should be able to discuss the structure of xylem, describe the mechanisms of water transport in plants, define transpiration, its types and importance, describe the modes of intake and transport of inorganic ions, and define water balance in plants.
	Transport and Accumulation of Organic Substances in Plants	At the end of this activity, students should be able to discuss the structure of phloem and indicate its location in a plant, name the organic compounds produced during photosynthesis and stored in plants, describe the transport of organic compounds from the leaves to other plant organs, and name examples of storage organs in plants.
	Responsiveness and Plant Movements	At the end of this activity, students should be able to define tropisms, nastic movements and taxis, present examples of plant movements, and explain mechanisms of tropisms and nastic movements.

CHAPTER	LESSON	DESCRIPTION
XV. Variation in Organisms	Variation of Organisms	At the end of this activity, students should be able to explain what the nature of variation consists in, distinguish between genetic and environmental variation, define phenotype, describe the differences between continuous and discontinuous variation, and present examples of both types of variation;
	Reproduction and Variation	At the end of this activity, students should be able to define a clone, explain why simple and mitotic divisions lead to the formation of clones, explain how genetic recombination occurs during meiosis, and explain the significance of genetic variation within a species.
	Mutations as a Source of Variation in Organisms	At the end of this activity, students should be able to define mutation, present the significance of mutations in somatic and reproductive cells, and define mutagens and present examples.
XVI. Heredity	Heredity According to Mendel	At the end of this activity, students should be able to define genotype, phenotype, gene, allele, discuss Mendel's first and second laws, and use a Punnett square.
	The Principles of Sex Inheritance in Humans	At the end of this activity, students should be able to discuss sex inheritance, define sex-linked and sex-influenced traits, name the disorders related to abnormalities in the number of sex chromosomes, and define karyotype and describe the human karyotype.
	The Chromosomal Theory of Inheritance	At the end of this activity, students should be able to discuss chromosomal inheritance and define linked genes – construct a chromosome map.
	Genetic Diseases	At the end of this activity, students should be able to define mutation and discuss the causes of selected genetic diseases – construct a pedigree chart.
	Inheritance of Blood Groups in Humans	At the end of this activity, students should be able to discuss the systems of blood grouping and describe the principles of blood group inheritance.
	Nucleic Acids	At the end of this activity, students should be able to discuss the structures of DNA and RNA and describe the structure and function of mRNA, tRNA and rRNA.
	The Gene as a Structural and Functional Unit of DNA	At the end of this activity, students should be able to discuss the processes of transcription and translation and describe the regulation of transcription.
	Mutations as Changes in DNA	At the end of this activity, students should be able to define point mutations and divide them into different categories, differentiate between point mutations and chromosomal aberrations, present examples of the effects of mutations and the methods by which the organism protects itself against them, and describe the mutation occurring in the case of sickle-cell disease and its effects.
XVII. Evolution	The Origin of Life on Earth	At the end of this activity, students should be able to recognize the organic compounds that may arise in an abiotic environment, describe an experiment to confirm the synthesis of organic compounds in an abiotic environment, list the characteristics that distinguish living organisms from inanimate matter, and describe the differences between the environmental conditions prevailing on Earth 4 billion years ago and now.
	Charles Darwin and the Theory of Evolution	At the end of this activity, students should be able to explain the consequences of the discovery of evolution and its mechanisms, explain how Darwin formulated his theory, and explain the significance of Darwin's scientific discoveries.
	Laws of Evolution and Speciation	At the end of this activity, students should be able to describe the basic mechanisms and principles of evolution and describe the process of species formation.

CHAPTER	LESSON	DESCRIPTION
	The History of Life on Earth	At the end of this activity, students should be able to the evolution of living organisms occurred in changing conditions, usually different from those of the present day, present-day groups of organisms have been evolving for hundreds of millions of years, and present-day species have developed over several millions of years.
	Human Evolution	At the end of this activity, students should be able to: indicate the major events in human evolution – indicate the most important achievements of human evolution – understand that human evolution from pre-human forms was a long and complex process – understand that the course of human evolution from pre-human forms has not been fully clarified to date – understand that the present evolution of the Homo sapiens is a cultural evolution.
XVIII. How We Combat Microorganisms and How We Use Them	**Bacterial Growth**	At the end of this activity, students should be able to explain the concept of doubling time, indicate the factors affecting bacterial growth, define bacterial colony and explain how to estimate the number of bacteria in a culture on the basis of the number of colonies, present a bacterial growth curve for a batch culture, and explain the principles of the chemostat.
	Protecting Food from Spoilage	At the end of this activity, students should be able to describe Pasteur's experiment to show the presence of bacteria in the air, name the factors that cause food spoilage, explain what pasteurization involves and give examples of pasteurized products, define sterilization and describe the methods of food sterilization, and present some traditional methods for inhibiting the development of bacteria in food.
	Biotechnology Past and Present	At the end of this activity, students should be able to define biotechnology and present examples of past and present biotechnological processes, explain the significance of fermentation as a key biological process in biotechnology, present the main stages in the production of beer, yogurt and hard cheeses, explain the importance of pasteurization in these processes, present generic names of the microorganisms taking part in these processes, describe single-celled protein and the substrates used in its production, and describe the structure of a biofermenter and the differences between batch and continuous cultures.
	Industrial Uses of Bacteria	At the end of this activity, students should be able to explain the principle of the biological treatment of municipal wastewater, explain how wastewater is purified by the activated sludge method and the biofiltration method, define eutrophication and explain the biological method for the removal of nitrogen and phosphorus compounds, explain how biogas is produced, discuss the role of enzymes in biological washing powders, and present the main stages of the industrial production of enzymes.
XIX. Genetic Engineering	**Genetic Engineering and its Applications in Biotechnology**	At the end of this activity, students should be able to: explain the artificial recombination of DNA – demonstrate the significance of restriction enzymes in manipulating DNA – explain the term "vector", give examples and describe its properties from the perspective of genetic engineering – demonstrate the stages of obtaining the product of a given gene in the bacterial cell – give examples of biologically active proteins obtained by genetic engineering techniques – explain the basics of the polymerase chain reaction (PCR).
	Other Applications of Genetic Engineering	At the end of this activity, students should be able to: explain what the Southern blot technique involves – present the principles of operation of genetic probes and examples of their application – explain the term "genetic fingerprint" – explain the goal of the Human Genome Project.
	Genetic Modification of Organisms	At the end of this activity, students should be able to: explain what selection involves – give examples of methods for the modification of crops – explain the terms genetically modified organisms, gene therapy, reproductive cloning and therapeutic cloning – describe the principal stages of organism cloning – give examples of the ethical problems arising from genetic modification of organisms.

CHAPTER	LESSON	DESCRIPTION
XX. Living Organisms and Their Environment	**The Individual and the Population**	At the end of this activity, students should be able to define species, individual and population, population size, range and density, reproduction rate and death rate, interpret a survivorship curve, and distinguish between abiotic and biotic factors.
	Competition and Predation	At the end of this activity, students should be able to use the term competition, recognize the various results of competition, recognize the variety of relationships possible between competing species, use the term predation, recognize the various results of predation, and recognize the variety of predator-prey relationships.
	Symbiosis	At the end of this activity, students should be able to use the term "symbiosis" correctly, recognize the different types of symbiotic associations, differentiate between the types of symbiotic associations, and recognize the effects of symbiosis and their significance.
	Life on Land	At the end of this activity, students should be able to notice the many adaptations to terrestrial life and identify the features that enable plants and animals to use the resources of the terrestrial environment.
	Life in Water	At the end of this activity, students should be able to recognize the many adaptations necessary for life in water, identify features that enable animals to use the resources of the aquatic environment, and recognize the similarities and differences in the adaptations of fish and whales to life in water.
	Adaptations of Organisms to the Environment	At the end of this activity, students should be able to describe the dynamic influence of environmental factors on adaptation, describe the range of adaptations and their categories, understand the causes of similar adaptations in unrelated groups of organisms, understand the significance of energy-saving adaptations, and understand the adaptational significance of gathering and processing information.
	Different Modes of Feeding in Mammals	At the end of this activity, students should be able to recognize the relationships between environmental factors and feeding-related adaptations in mammals, recognize the reasons for the development of different feeding-related adaptations in mammals, recognize the effects of different feeding-related adaptations in mammals, and understand the value of feeding-related adaptations in mammals.
	Humans and the Environment	At the end of this activity, students should be able to describe the nature, range and uniqueness of the adaptations of humans to the environment, describe the relationship between the level of human existence and the state of natural resources, describe the effects of human activities on the natural environment, understand the dependency of humans on environmental resources and factors, understand that macroeconomic plans and calculations should take into consideration the effects of human activities on nature, and understand the necessity to minimize the negative effects of human activities on nature.
	Environmental Pollution	At the end of this activity, students should be able to understand the relationship between the introduction of substances, energy and species into the environment by man and the changes that they cause in the environment, understand the adverse effects of pollution on the standard of living of humankind, understand the adverse effects of pollution on all the components of the natural environment and the relationships that exist in it, understand the dependency of humankind on environmental resources and factors, understand why it is necessary to include the effects of human activity on nature in macroeconomic planning and accounting, and understand why it is necessary to minimise the adverse effects of human activity on the environment.

CHAPTER	LESSON	DESCRIPTION
	The Greenhouse Effect and the Ozone Hole	At the end of this activity, students should be able to describe how human activities cause global changes in the natural environment, describe the dependency of humans on environmental resources and factors, explain the necessity of taking into account the effects of human activities on the natural environment in macroeconomic plans and calculations, describe the necessity to minimize the adverse effects of humans on the natural environment, and explain the difficulties in assessing the proportional effects of human activities and natural processes on the natural environment.
	Conservation of Natural Resources	At the end of this activity, students should be able to determine the range and pace of changes in the natural environment caused by humans, describe the importance of the conservation of natural resources for the continued existence of the natural environment and humankind, describe the measures for nature conservation, understand the relationship between the quality of human life and the degree of conservation of natural resources, understand the principle behind the conservation of natural resources by the protection of entire ecosystems, and understand the need for long-term planning in the exploitation and economical use of natural resources.
XXI. The Flow of Energy and Matter, Information Exchange	**Ecosystem**	At the end of this activity, students should be able to use the concepts of: ecosystem, biocenosis, biotope, recognize the abundance of connections between species inhabiting an ecosystem and their connections with the abiotic environment, and recognize the mechanisms functioning within an ecosystem.
	Food Chains	At the end of this activity, students should be able to use the terms: food chain, trophic level and food web, notice the abundance of potential interdependencies between species inhabiting one ecosystem, and notice the abundance of pathways of energy flow and matter circulation in an ecosystem.
	Information in Nature	At the end of this activity, students should be able to describe the different types of information about the environment that are vital for life, describe the modes of communication between individuals of the same species and different species, understand the significance of information about the environment for the survival and development of individuals (populations, species), understand the significance of communication for the survival and development of an individual (population, species), and understand the significance of genetic information in nature.
	Biogeochemical Cycles	At the end of this activity, students should be able to understand the inter-relationships between the elements of the ecosystem that take part in the natural cycles of matter.

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.