

Unit I: The Science of Life (2 weeks)

Essential Questions	Topics/Objectives	Skills	Content/ Key Terminology
• What is science? • What is the scientific method, and why is it used by scientists from all scientific disciplines? • How does a scientists develop a hypothesis? • How does a scientist test a hypothesis? • How does a scientific theory develop? • What are the characteristics of living things? • How can life be studied at different levels? • What constitutes life, and where does one draw the line between living and nonliving things? • What are the branches of biology, and how are they different from and similar to one another? • What measurement systems do most scientists use? • How are light microscopes and electron microscopes similar and different?	• Identify and describe the steps of the scientific method. • Explain what constitutes a good hypothesis. • Explain the difference between control and experimental groups with respect to dependent and independent variables. • Identify and describe the steps in a controlled experiment. • Identify the characteristics of living things. • Explain and describe different tools of a biologist, including the different types of microscopes. •	• Demonstrate the use of the scientific methods by formulating a hypothesis and related set of experimental procedures to solve a problem. • Using the scientific method, create a properly formatted and organized lab report. • Use the tools of a biologist, such as a microscope, to collect data. • Demonstrate proper lab safety and techniques.	• Science • Observation • Data • Inference • Scientific method • Hypothesis • Control group • Experimental group • Dependent and independent variables • Biology • Cell • Sexual reproduction • Asexual reproduction • Metabolism • Stimulus • Homeostasis • Evolution • Metric system • Microscope • Compound light microscope • Electron microscope

Unit II: Chemistry of Life (2 weeks)

Essential Questions	Topics/Objectives	Skills	Content/ Key Terminology
• What are the building blocks of matter? • What three subatomic particles make up atoms? • How are all of the isotopes of an element similar? • What is a chemical bond, and how are they formed? • What are the two main types of chemical bonds? • Why are water molecules polar? • What are acidic solutions? • What are basic solutions? • What are the physical and chemical properties of the molecules of life? • What is an organic compound, and how are they formed? • What are the principal organic compounds involved in biological processes? • What are the functions of each group of organic compounds? • How does the structure of matter affect the properties and uses of organic/carbon compounds? • What are the roles of the major organic compounds in living cells? • What happens to chemical bonds during chemical reactions?	• Identify the building blocks of matter. • Identify and describe the two main types of chemical bonds – ionic and covalent. • Identify the most important elements and compounds in living things. • Describe the molecular structure of water and explain how this relates to its properties and its role in living organisms. • Describe the properties of acids and bases. • Explain the difference between organic and inorganic. • Identify the four major organic compounds found and produced in the living cell: carbohydrates, proteins, lipids, and nucleic acids. • Describe the functions and characteristics of each type of organic molecule. • Identify the four monomers which make up the four groups of organic compounds and the chemical bonds that join the various monomers to make the polymers. • Describe the roles of carbohydrates, proteins, lipids,	• Using a diagram, demonstrate the structure of an atom and its parts. • Using a diagram, demonstrate the structure of a water molecule. • Match the correct monomers to the following polymers: starch, protein, fat, nucleic acid. • Using a structural formula, demonstrate a carbohydrate. • Organize chemistry of life terms on concepts maps in a way that correctly demonstrates the relationships of the terms to the main concept. • Complete a detailed, thorough, and accurate lab write-up that relates knowledge of organic compounds to the lab exercise. • Construct examples of three organic molecules, lipids, carbohydrates, and proteins, using molecular model kits. • Create a properly formatted and organized lab report.	• Atom • Proton • Electron • Nucleus • Molecule • Element • Periodic table • Chemical bonds • Compounds • Ionic bond • Ion • Covalent bond • Cohesion • Adhesion • Mixture • Solution • Solute • Solvent • Suspension • pH scale • Acid • Base • Buffer • Organic and inorganic compounds • Carbohydrates • Monomers • Polymers • Saccharides (mono-, di-, poly-) • Nucleic acid • Nucleotide • RNA

• How do energy changes affect whether a chemical reaction will occur? • Why are enzymes important to living things?	and nucleic acids in the function of a living cell. • Explain the role and importance of enzymes to living things and their metabolic cell process. • Explain the difference between mono-, di-, and polysaccharides, provide examples of each, and identify a role for each in living organisms. • Explain the difference between condensation and hydrolysis reactions. • Identify the different types of fats and the functions of these fats. • Describe the different types of structures in which proteins are found and the functions of proteins. • Describe the structure and function of nucleic acids. • Describe what happens during a chemical reaction. • Describe the role of energy in a chemical reaction. • What is the role of enzymes in chemical reactions that take place within the cell?		• DNA • Protein • Amino acid • Chemical reaction • Reactant • Product • Activation energy • Catalyst • Enzyme
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Unit III: Cell Structure, Function, and Energy (5 weeks)

Essential Questions	Topics/Objectives	Skills	Content/ Key Terminology
- What scientific technology led to the discovery of the cell? - Why is the cell the fundamental unit of life? - What is the modern cell theory? - How are cell organelle structure and function related? - What are the similarities and differences between prokaryotic and eukaryotic cells? - What are the different parts of a cell that make it function? - Why do living organisms need energy? - How does the cell membrane maintain homeostasis in cells? - How does a cell transport substances into and out of itself? - What are the limits to cell size? - What are enzymes, and why are they important? - How are the structure and properties of an enzyme related to its function? - How does the structure of the cell membrane facilitate transport of molecules through the membrane? - What is cellular respiration? - How do living organisms transfer the energy from glucose into ATP molecules?	- Describe the role of the microscope in the discovery of the cell. - Summarize the cell theory. - Describe some exceptions to the cell theory. - Explain why cell theory is a major unifying theme in biology. - Explain the principal differences between prokaryotic and eukaryotic cells. - Identify and classify prokaryotes according to structure and shape. - Compare and contrast structure and function of organelles. - Describe organizational levels in eukaryotic organisms. - Identify and describe the parts of a cell - Explain the principal differences between animal and plant cells. - Describe the structure and function of plant and animal cell organelles. - Identify and describe the parts of the compound microscope, and explain how magnification is calculated. - Describe the structure of the cell membrane. - Identify and describe the different types of cell transport. - Explain how the cell membrane is responsible for osmosis,	- Identify and use the different parts of a compound microscope in a lab experience. - Draw and label a diagram of a simple plant and animal cell. - Calculate specimen magnification on a light microscope. - Sketch plant and animal cells visualized through a compound microscope. - Predict what substances can enter and exit the cell. - Diagram and describe the carbon dioxide cycle, the water cycle, and explain the processes through which plants get their energy to survive. - Predict how oxygen debt will affect a eukaryote. - Given a diagram, explain how water diffuses along its concentration gradient. - Describe in writing and a diagram the structure and function of mitochondria. - Sketch and label a simplified diagram of ADP and ATP. - Design and communicate data through an experimental design that identifies factors that affect the rate of photosynthesis. - Articulate conclusions and explanations based on scientific	- Microscope - Cell theory - Prokaryotic cells - Eukaryotic cells - Organelles - Cell membrane - Enzymes - ATP molecules - Cytoplasm - Endoplasmic reticulum - Ribosomes - Mitochondria - Vacuoles - Lysosomes - Golgi bodies - Microtubules - Chloroplasts - Cilia - Flagella - Cell wall - Chlorophyll - Centrosome - Centrioles - Passive transport - Diffusion - Osmosis - Active transport - Endocytosis - Exocytosis - Cellular respiration - ATP molecules - Glycolysis

• How does the ATP molecule provide usable energy for the cell's activities? • What is photosynthesis, and how does it generate energy for cells?	facilitated diffusion, and active transport. • Describe the lock and key hypothesis of enzyme action. • Explain how the lock and key hypothesis of enzyme action relates to factors affecting the rate of action of enzymes. • Describe the structure and function of mitochondria. • Describe the various structures and specialized roles of eukaryotic cells. • Explain how trophic interactions affect how organisms differ in the way they get their energy. • Describe the process of cellular respiration. • Describe the overall reaction of photosynthesis. • Describe the structure and function of the chloroplast and the role of chlorophyll. • Explain how the structure of a cell membrane facilitates transport through the membrane. • Identify and describe different types of cell transport. • State the overall reaction of cellular respiration. • Compare photosynthesis and cellular respiration and their role in the oxygen cycle. • Describe the three stages of aerobic respiration and identify where they occur in the cell. • Identify the main products of each state of aerobic respiration and explain how many ATP	data regarding factors such as temperature and water availability.	• Anaerobic process • Aerobic respiration • Krebs Cycle • Electron transport chain • Fermentation • Autotrophic cells • Photosynthesis • Chemosynthesis
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	molecules are produced at each stage. • Name the two types of fermentation. • Describe the similarities and differences between aerobic respiration and fermentation. • Explain what is meant by a high energy bond in ATP and describe its role as “currency” in cells. • Identify three pathways the body uses to release energy during exercise.		
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Unit IV: Cellular Reproduction (3 weeks)

Essential Questions	Topics/Objectives	Skills	Content/ Key Terminology
• Why do cells need to divide? • How and when do cells divide? • What events occur during a cell's life cycle? • What is mitosis, and why is it important phase in a cell's life cycle? • What is meiosis? • What are the similarities and differences between mitosis and meiosis? • What are the stages of meiosis, and what occurs during each of the stages of meiosis? • What is cancer, and how is a cancer cell different from a normal cell? • What processes are responsible for life's unity and diversity? • How does DNA replicate? • What are the roles of DNA and RNA in protein synthesis? • What are genetic mutations? • How does cell size affect cell division? • What are the major events in the cell cycle? •	• Explain why cells need to divide and how cell division fits into the phases of the cell's life cycle. • Describe mitosis and explain what changes the cell undergoes during mitosis. • Describe meiosis and explain what changes the cell undergoes during meiosis. • Explain how the structure of DNA lends itself to be replicated, repaired, and copied exactly. • Explain how DNA is the code for life via the blueprints for making proteins through an intermediary RNA. • Summarize the events of DNA replication. • Compare and contrast the structures and functions of DNA, RNA, and proteins. • Describe the general roles of DNA and RNA in protein synthesis. • Describe the general role of enzymes in metabolic cell processes. • Explain how protein synthesis is a process in which DNA is transcribed to RNA and then proteins are created via translation.	• “Decode” a sample DNA base sequence through RNA and using codons create a polypeptide sequence. • Measure data regarding cell size, lot the data, and explain how this affects life functions.	• Phases of a cell's life cycle • Interphase • Mitosis • Prophase • Metaphase • Anaphase • Telophase • Cell division • Chromosomes • Gametes • Meiosis • Diploid cell • Monoploid cell • Crossing over • Stages of meiosis • Spermatogenesis • Oogenesis • Cancer

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