Instructor: Staci Short School: Kalkaska High School

Subject: Biology Grade(s): 10

Instructional Materials: Holt “Biology” – Johnson and Raven

Month	Topics	Time Spent (weeks)	MCF Benchmarks, or Grade Level Content Expectations (GLCEs)

September	Characteristics of Life Themes of Biology Scientific Method <u>Metric System</u>	2 weeks	B1.1A Generate new questions that can be investigated in the laboratory or field. B1.1B Evaluate the uncertainties or validity of scientific conclusions using an understanding of sources of measurement error, the challenges of controlling variables, accuracy of data analysis, logic of argument, logic of experimental design, and/or the dependence on underlying assumptions. B1.1C Conduct scientific investigations using appropriate tools and techniques (e.g., selecting an instrument that measures the desired quantity—length, volume, weight, time interval, temperature—with the appropriate level of precision). B1.1D Identify patterns in data and relate them to theoretical models. B1.1E Describe a reason for a given conclusion using evidence from an investigation. B1.2h Describe the distinctions between scientific theories, laws, hypotheses, and observations.	
	Chemistry and Biochemistry	3 weeks	B2.2A Explain how carbon can join to other carbon atoms in chains and rings to form large and complex molecules. B2.2B Recognize the six most common elements in organic molecules (C, H, N, O, P, S). B2.2C Describe the composition of the four major categories of organic molecules (carbohydrates, lipids, proteins, and nucleic acids). B2.2D Explain the general structure and primary functions of the major complex organic molecules that compose living organisms. B2.2E Describe how dehydration and hydrolysis relate to organic molecules. B2.2f Explain the role of enzymes and other proteins in biochemical functions (e.g., the protein hemoglobin carries oxygen in some organisms, digestive enzymes, and hormones). B2.4f Recognize and describe that both living and nonliving things are composed of compounds, which are themselves made up of elements joined by energy containing bonds, such as those in ATP. B2.5A Recognize and explain that macromolecules such as lipids contain high energy bonds. B1.1C Conduct scientific investigations using appropriate tools and techniques (e.g., selecting an instrument that measures the desired quantity—length, volume, weight, time interval, temperature—with the appropriate level of precision).	

October	Matter and Energy in Ecosystems	3 weeks	B2.1A Explain how cells transform energy (ultimately obtained from the sun) from one form to another through the processes of photosynthesis and respiration. Identify the reactants and products in the general reaction of photosynthesis. B2.1B Compare and contrast the transformation of matter and energy during photosynthesis and respiration. B2.5C Describe how energy is transferred and transformed from the Sun to energy-rich molecules during photosynthesis. B3.1A Describe how organisms acquire energy directly or indirectly from sunlight. B3.1B Illustrate and describe the energy conversions that occur during photosynthesis and respiration. B3.1C Recognize the equations for photosynthesis and respiration and identify the reactants and products for both. B3.1D Explain how living organisms gain and use mass through the processes of photosynthesis and respiration. B3.1e Write the chemical equation for photosynthesis and cellular respiration and explain in words what they mean. B3.2A Identify how energy is stored in an ecosystem. B3.2B Describe energy transfer through an ecosystem, accounting for energy lost to the environment as heat. B3.2C Draw the flow of energy through an ecosystem. Predict changes in the food web when one or more organisms are removed. B3.3A Use a food web to identify and distinguish producers, consumers, and decomposers and explain the transfer of energy through trophic levels. B3.3b Describe environmental processes (e.g., the carbon and nitrogen cycles) and their role in processing matter crucial for sustaining life.

November	Cell Structure and Function Cell Energetics	2 weeks 2 weeks	B2.4g Explain that some structures in the modern eukaryotic cell developed from early prokaryotes, such as mitochondria, and in plants, chloroplasts. B2.4h Describe the structures of viruses and bacteria. B2.4i Recognize that while viruses lack cellular structure, they have the genetic material to invade living cells. B2.5g Compare and contrast plant and animal cells. B2.5h Explain the role of cell membranes as a highly selective barrier (diffusion, osmosis, and active transport). B2.5i Relate cell parts/organelles to their functions. B2.4e Relate cell parts/organelles to their functions. B2.5D Describe how individual cells break down energy-rich molecules to provide energy for cell functions. B2.5e Explain the interrelated nature of photosynthesis and cellular respiration in terms of ATP synthesis and degradation. B2.5f Relate plant structures and functions to the process of photosynthesis and respiration. B3.1B Illustrate and describe the energy conversions that occur during photosynthesis and respiration. (also repeated in Ecology) B3.1C Recognize the equations for photosynthesis and respiration and identify the reactants and products for both. (also repeated in Ecology) B3.1f Summarize the process of photosynthesis.

December	Comparative Structure and Function of Living Things And Human Systems	3 weeks	B2.4B Describe how various organisms have developed different specializations to accomplish a particular function and yet the end result is the same (e.g., excreting nitrogenous wastes in animals, obtaining oxygen for respiration). B2.4C Explain how different organisms accomplish the same result using different structural specializations (gills vs. lungs vs. membranes). B2.5B Explain how major systems and processes work together in animals and plants, including relationships between organelles, cells, tissues, organs, organ systems, and organisms. Relate these to molecular functions. B2.1e Predict what would happen if the cells from one part of a developing embryo were transplanted to another part of the embryo. B2.3d Identify the general functions of the major systems of the human body (digestion, respiration, reproduction, circulation, excretion, protection from disease, and movement, control, and coordination) and describe ways that these systems interact with one another. B2.3g Compare the structure and function of a human body system or subsystem to a nonliving system (e.g., human joints to hinges, enzymes and substrate to interlocking puzzle pieces). B4.3g Explain that cellular differentiation results from gene expression and/ or environmental influence (e.g., metamorphosis, nutrition).
January	Homeostasis and Health	2 weeks	B2.3A Describe how cells function in a narrow range of physical conditions, such as temperature and pH (acidity) to perform life functions. B2.3B Describe how the maintenance of a relatively stable internal environment is required for the continuation of life. B2.3C Explain how stability is challenged by changing physical, chemical, and environmental conditions as well as the presence of disease agents. B2.3e Describe how human body systems maintain relatively constant internal conditions (temperature, acidity, and blood sugar). B2.3f Explain how human organ systems help maintain human health. B2.6a Explain that the regulatory and behavioral responses of an organism to external stimuli occur in order to maintain both short- and long-term equilibrium.

February	Cell Division and Chromosome Mutations	3 weeks	B2.1C Explain cell division, growth, and development as a consequence of an increase in cell number, cell size, and/or cell products. B2.1d Describe how, through cell division, cells can become specialized for specific function. B3.5d Describe different reproductive strategies employed by various organisms and explain their advantages and disadvantages. B4.2A Show that when mutations occur in sex cells, they can be passed on to offspring (inherited mutations), but if they occur in other cells, they can be passed on to descendant cells only (non-inherited mutations). B4.3A Compare and contrast the processes of cell division (mitosis and meiosis), particularly as those processes relate to production of new cells and to passing on genetic information between generations. B4.3B Explain why only mutations occurring in gametes (sex cells) can be passed on to offspring. B4.3C Explain how it might be possible to identify genetic defects from just a karyotype of a few cells. B4.3d Explain that the sorting and recombination of genes in sexual reproduction result in a great variety of possible gene combinations from the offspring of two parents. B4.3e Recognize that genetic variation can occur form such processes as crossing over, jumping genes, and deletion and duplication of genes. B4.3f Predict how mutations may be transferred to progeny. B4.4b Explain that gene mutation in a cell can result in uncontrolled cell division called cancer. Also know that exposure of cells to certain chemicals and radiation increases mutations and thus increases the chance of cancer. B5.3e Explain how changes at the gene level are the foundation for changes in populations and eventually the formation of a new species.

March	DNA/RNA and Protein Synthesis	3 weeks	B4.1B	Explain that the information passed from parents to offspring is transmitted by means of genes that are coded in DNA molecules. These genes contain the information for the production of proteins.
			B4.2B	Recognize that every species has its own characteristic DNA sequence.
			B4.2C	Describe the structure and function of DNA.
			B4.2D	Predict the consequences that changes in the DNA composition of particular genes may have on an organism (e.g., sickle cell anemia, other).
			B4.2E	Propose possible effects (on the genes) of exposing an organism to radiation and toxic chemicals.
			B4.2f	Demonstrate how the genetic information in DNA molecules provides instructions for assembling protein molecules and that this is virtually the same mechanism for all life forms.
			B4.2g	Describe the processes of replication, transcription, and translation and how they relate to each other in molecular biology.
			B4.4c	Explain how mutations in the DNA sequence of a gene may be silent or result in phenotypic change in an organism and in its offspring.

April	Mendelian and Molecular Genetics (includes Biotechnology)	3 weeks	B4.1A Draw and label a homologous chromosome pair with heterozygous alleles highlighting a particular gene location. B4.1c Differentiate between dominant, recessive, co-dominant, polygenic, and sex-linked traits. B4.1d Explain the genetic basis for Mendel's laws of segregation and independent assortment. B4.1e Determine the genotype and phenotype of monohybrid crosses using a Punnett Square. B4.2h Recognize that genetic engineering techniques provide great potential and responsibilities. B4.4a Describe how inserting, deleting, or substituting DNA segments can alter a gene. Recognize that an altered gene may be passed on to every cell that develops from it and that the resulting features may help, harm, or have little of no effect on the offspring's success in its environment. B4.2i Explain how recombinant DNA technology allows scientists to analyze the structure and function of genes. B5.3f Demonstrate and explain how biotechnology can improve a population and species.

May	Evolution	3 weeks	B2.4A Explain that living things can be classified based on structural, embryological, and molecular (relatedness of DNA sequence) evidence. B2.4d Analyze the relationships among organisms based on their shared physical, biochemical, genetic, and cellular characteristics and functional processes. B3.4B Recognize and describe that a great diversity of species increases the chance that at least some living organisms will survive in the face of cataclysmic changes in the environment. B5.1A Summarize the major concepts of natural selection (differential survival and reproduction of chance inherited variants, depending on environmental conditions). B5.1B Describe how natural selection provides a mechanism for evolution. B5.1c Summarize the relationships between present-day organisms and those that inhabited the Earth in the past (e.g., use fossil record, embryonic stages, homologous structures, chemical basis). B5.1d Explain how a new species or variety originates through the evolutionary process of natural selection. B5.1e Explain how natural selection leads to organisms that are well suited for the environment (differential survival and reproduction of chance inherited variants, depending upon environmental conditions). B5.1f Explain, using examples, how the fossil record, comparative anatomy and other evidence supports the theory of evolution B5.1g Illustrate how genetic variation is preserved or eliminated from a population through natural selection (evolution) resulting in biodiversity. B5.2a Describe species as reproductively distinct groups of organisms that can be classified based on morphological, behavioral, and molecular structures. B5.2b Explain that the degree of kinship between organisms or species can be estimated from similarity of their DNA and protein sequences. B5.2c Trace the relationship between environmental changes and changes in the gene pool, such as genetic drift and isolation of subpopulations. B5.3A Explain how natural selection acts on individuals, but it is populations that evolve. Relate genetic mutations and genetic variety produced by sexual reproduction to diversity within a given population. B5.3B Describe the role of geographic isolation in speciation. B5.3C Give examples of ways in which genetic variation and environmental factors are causes of evolution and the diversity of organisms. B5.3d Explain how evolution through natural selection can result in changes in biodiversity.

June	Population Ecology and Human Impacts on Ecosystems	2 weeks	B2.2g	Propose how moving an organism to a new environment may influence its ability to survive and predict the possible impact of this type of transfer.
			B3.4A	Describe ecosystem stability. Understand that if a disaster such as flood or fire occurs, the damaged ecosystem is likely to recover in stages of succession that eventually result in a system similar to the original one.
			B3.4C	Examine the negative impact of human activities.
			B3.4d	Describe the greenhouse effect and list possible causes.
			B3.4e	List the possible causes and consequences of global warming.
			B3.5A	Graph changes in population growth, given a data table.
			B3.5B	Explain the influences that affect population growth.
			B3.5C	Predict the consequences of an invading organism on the survival of other organisms.
			B3.5e	Recognize that and describe how the physical or chemical environment may influence the rate, extent, and nature of population dynamics within ecosystems.
			B3.5f	Graph an example of exponential growth. Then show the population leveling off at the carrying capacity of the environment.
			B3.5g Diagram and describe the stages of the life cycle for a human disease-causing organism.	