Tennessee
BIOLOGY (Semester)
2019-2020 Pacing Guide

Unit	Standards	Major Topics/Concepts
Characteristics of Life and Cell Types	LS1.1 LS1.2	Compare and contrast existing models, identify patterns, and use structural and functional evidence to analyze the characteristics of life. Engage in argument about the designation of viruses as non-living based on these characteristics. Evaluate comparative models of various cell types with a focus on organic molecules that make up cellular structures. *Science and Engineering Practices should be embedded and reinforced through actual experimentation throughout the course.*
DNA and Protein Synthesis, Structure, and Function	LS1.3 LS1.4 LS1.5	Integrate evidence to develop a structural model of a DNA molecule. Using the model, develop and communicate an explanation for how DNA serves as a template for self-replication and encodes biological information. Demonstrate how DNA sequence information is decoded through transcriptional and translational processes within the cell in order to synthesize proteins. Examine the relationship of structure and function of various types of RNA and the importance of this relationship in these processes. Research examples that demonstrate the functional variety of proteins and construct an argument based on evidence for the importance of the molecular structure to its function. Plan and carry out a controlled investigation to test predictions about factors, which should cause an effect on the structure and function of a protein.
Cell Cycle and Cell Transport	LS1.6 LS1.7	Create a model for the major events of the eukaryotic cell cycle, including mitosis. Compare and contrast the rates of cell division in various eukaryotic cell types in multicellular organisms. Utilize a model of a cell plasma membrane to compare the various types of cellular transport and test predictions about the movement of molecules into or out of a cell based on the homeostasis of energy and matter in cells.
Photosynthesis and Cellular Respiration	LS1.8 LS1.9	Create a model of photosynthesis demonstrating the net flow of matter and energy into a cell. Use the model to explain energy transfer from light energy into stored chemical energy in the product.

Unit	Standards	Major Topics/Concepts
		Create a model of aerobic respiration demonstrating flow of matter and energy out of a cell. Use the model to explain energy transfer mechanisms. Compare aerobic respiration to alternative processes of glucose metabolism.
Biogeochemical Cycles	LS2.2 LS2.3	Create a model tracking carbon atoms between inorganic and organic molecules in an ecosystem. Explain human impacts on climate based on this model. Analyze through research the cycling of matter in our biosphere and explain how biogeochemical cycles are critical for ecosystem function.
1st Cumulative Benchmark (covering all content to this point)		
Ecosystems	LS2.1 LS2.4 LS2.5	Analyze mathematical and/or computational representations of population data that support explanations of factors that affect population size and carrying capacities of populations within an ecosystem. Examine a representative ecosystem and, based on interdependent relationships present, predict population size effects due to a given disturbance. Analyze data demonstrating the decrease in biomass observed in each successive trophic level. Construct an explanation considering the laws of conservation of energy and matter and represent this phenomenon in a mathematical model to describe the transfer of energy and matter between trophic levels. Analyze examples of ecological succession, identifying and explaining the order of events responsible for the formation of a new ecosystem in response to extreme fluctuations in environmental conditions or catastrophic events.
Heredity: Inheritance and Variation of Traits	LS3.1 LS3.2 LS3.3 ETS2.2 ETS2.3	Model chromosome progression through meiosis and fertilization in order to argue how the processes of sexual reproduction lead to both genetic similarities and variation in diploid organisms. Compare and contrast the processes of sexual and asexual reproduction, identifying the advantages and disadvantages of each. Explain how protein formation results in phenotypic variation and discuss how changes in DNA can lead to somatic or germ line mutations. Through pedigree analysis, identify patterns of trait inheritance to predict family member genotypes. Use mathematical thinking to predict the likelihood of various types of trait transmission. Investigate the means by which karyotypes are utilized in diagnostic medicine. Analyze scientific and ethical arguments to support the pros and cons of application of a specific biotechnology

Unit	Standards	Major Topics/Concepts
		technique such as stem cell usage, in vitro fertilization, or genetically modified organisms.
Biological Change: Unity and Diversity	LS4.1 LS4.2 LS4.3 ETS2.1	Evaluate scientific data collected from analysis of molecular sequences, fossil records, biogeography, and embryology. Identify chronological patterns of change and communicate that biological evolution is supported by multiple lines of empirical evidence that identify similarities inherited from a common ancestor (homologies). Using a model that demonstrates the change in allele frequencies resulting in evolution of a population over many generations, identify causative agents of change. Identify ecosystem services and assess the role of biodiversity in support of these services. Analyze the role human activities have on disruption of these services. Obtain, evaluate, and communicate information on how molecular biotechnology may be used in a variety of fields.
Final Comprehensive Benchmark (covering all content)		