BIOLOGY PACING GUIDE

FIRST QUARTER				
UNIT	**PACING**	**TOPICS**	**STANDARDS**	**LEARNING OBJECTIVES**
Introduction to Biology	**4 weeks**	**1. Lab/Classroom Rules and Procedures** **2. Lab Equipment** **3. Claim, Evidence, Reasoning** **4. Roots, Prefixes, & Suffixes** **5. Characteristics of Life** **6. Properties of Water** **7. Macromolecules** **8. Enzymes**	• **BIO1.LS1.1 Characteristics of Life** • **BIO1.LS1.2 Organic Molecules** • **BIO1.LS1.5 Protein Structure & Function**	• Use the CER method to answer scientific questions • Synthesize the meaning of a term by using prefixes, suffixes, and roots • Provide evidence for life • Argue for or against life, given information about an organism • Characterize the properties of water and explain the importance of water to life • Identify the four major classes of macromolecules and distinguish between monomers and polymers • Compare and contrast the structure(s), functions, and locations of each macromolecule • Describe the biological importance of lipids, carbohydrates, proteins, and nucleic acids as they pertain to life processes • Compare and contrast the function of an enzyme through investigation • Explain the effects of environmental conditions on enzyme rates • Analyze graphs pertaining to enzyme activity (pH, temperature, substrate concentration)
Cells	**5 weeks**	**1. Cell Theory & Types of Cells** **2. Cell Organelles** **3. Cellular Transport** **4. The Cell Cycle** **5. Cell Regulation & Cancer** **6. Stem Cells**	• **BIO1.LS1.2 Organic Molecules** • **BIO1.LS1.7 Cell Transport** • **BIO1.LS1.6 Cell Cycle** • **BIO1.ETS2.3 Science vs. Ethics**	• Distinguish between prokaryotic and eukaryotic cells, and plant and animal cells • Explain the function of each of the organelles and identify them given a diagram or description • Describe the role of proteins, lipids, and carbohydrates in the structure of the phospholipid bilayer • Explain how the cell membrane helps maintain homeostasis in the cell • Differentiate between passive and active transport and describe the role that energy plays in each type • Illustrate the difference between a hypotonic, isotonic, and hypertonic solution and describe the effect that each solution has on the cell • Explain the difference between a stem cell and a differentiated cell • Predict the consequences that might occur if a cell does not properly complete any of the mitotic stages • Describe the stages of mitosis and summarize the result of mitosis • Explain how cells know how to divide, describe the importance of checkpoints in the cell cycle, and apoptosis in the regulation of the cell cycle • Differentiate between malignant and benign tumors, and list 5 potential carcinogens

SECOND QUARTER				
UNIT	**PACING**	**TOPICS**	**STANDARDS**	**LEARNING OBJECTIVES**
Energy Flow	**4 weeks**	**1. Photosynthesis** **2. Cellular Respiration** **3. Energy Flow through Ecosystems**	• **BIO1.LS1.8 Photosynthesis** • **BIO1.LS1.9 Cellular Respiration** • **BIO1.LS2.2 Carbon Cycle** • **BIO1.LS2.4 Conservation of Energy & Matter**	• Explain how light energy can be used to create glucose and oxygen and how this process benefits us • Write and interpret the chemical formula for photosynthesis and cellular respiration • Identify the reactants and products for photosynthesis and cellular respiration • Describe the steps of photosynthesis with regards to the light dependent and light independent (Calvin cycle) reactions, including reactants and products involved and where each step occurs in the chloroplast • Explain how products from photosynthesis can be used to create carbon dioxide, water, and ATP for cellular use • Describe the difference between aerobic and anaerobic respiration and explain which process is most efficient in terms of ATP generated • Illustrate the steps of cellular respiration with regards to glycolysis, the Krebs cycle, and the Electron Transport Chain, including reactants and products involved and where each step occurs in the cell • Explain how energy cycles through an ecosystem • Describe how a trophic pyramid's shape relates to the number of organisms and available energy at each level • Calculate the energy lost/gained between trophic levels and identify the potential affect that one trophic level might have on other trophic levels within an ecosystem
Genetics	**4 weeks**	**1. DNA/RNA Structure & Function** **2. DNA Replication** **3. Protein Synthesis** **4. Meiosis** **5. Gene Mutations** **6. Biotechnology**	• **BIO1.LS1.3 DNA** • **BIO1.LS1.4 Protein Synthesis** • **BIO1.LS3.1 Meiosis & Types of Reproduction** • **BIO1.LS3.2 Phenotypes & Mutations** • **BIO1.ETS2.1 Biotechnology**	• Explain the role of DNA in storing and transmitting cellular information • Compare and contrast DNA and RNA in terms of structure and function • Model base-pairing rules of DNA given a template strand and explain Chargaff's rule in regard to calculating percentage of each nitrogenous base • Explain and summarize the process of DNA replication and distinguish the roles that enzymes play in replication • Summarize the central dogma and describe the process of protein synthesis • Transcribe and translate sample strands of DNA and predict a consequence for error made during replication, transcription, or translation • Compare and contrast the process of mitosis and meiosis, include the end result • Describe how meiosis I creates unique gene combinations and how crossing over increases genetic diversity • Differentiate between somatic cells and gametes and explain the difference between sex chromosomes and autosomes • Distinguish between different types of mutations, and list some factors that cause mutations • Explain why some mutations may or may not affect an organism's traits • Describe the overall goal, and pros and cons of genetic engineering • Explain how biotechnology is used to solve problems in forensics, agriculture, and the medical field

THIRD QUARTER				
UNIT	**PACING**	**TOPICS**	**STANDARDS**	**LEARNING OBJECTIVES**
Heredity	**3 weeks**	**1. Introduction to Heredity** **2. Mendelian Genetics** **3. Complex Inheritance** **4. Pedigrees** **5. Genetic Disorders & Chromosomal Mutations**	• **BIO1.LS3.2 Phenotypes & Mutations** • **BIO1.LS3.3 Trait Inheritance**	• Explain the connection between heredity and traits • Differentiate between asexual and sexual reproduction and identify the advantages and disadvantages of each • Summarize Mendel's experiments and the three laws of inheritance • Use a Punnett square to determine genotypic and phenotypic ratios • Create and read a dihybrid cross to solve basic heredity problems • Explain the difference between incomplete dominance and codominance, and polygenic traits and multiple alleles, and provide examples of each • Explain the difference between traits inherited on sex chromosomes and traits inherited on autosomes • Perform crosses using Punnett squares for codominance, incomplete dominance, multiple alleles, and sex-linked traits • Use a pedigree to determine if the inheritance pattern for a disease/trait is dominant or recessive, and sex-linked or autosomal, and identify the genotypes of individuals • Compare and contrast a mutation in a somatic cell vs a mutation in a gamete and explain the implications of both • Differentiate between gene mutations and chromosome mutations, and identify chromosome mutations given a karyotype
Evolution	**4 Weeks**	**1. Principles of Evolution** **2. The Theory of Natural Selection** **3. Evidence of Evolution** **4. Population Genetics** **5. Mechanisms of Evolution** **6. Evolutionary Patterns & Processes** **7. Phylogeny & Evolutionary Relatedness**	• **BIO1.LS4.1 Evidence for Evolution** • **BIO1.LS4.2 Allele Frequencies** • **BIO1.LS4.3 Biodiversity**	• Summarize the four principles of natural selection • Explain how diversity within a species has resulted in an increase in fitness and list the different factors that contribute to genetic variation • Summarize different types of evidence that support evolution • Predict evolutionary relatedness between organisms based on provided evidence • Describe the significance of genetic variation within a population, and identify sources of genetic variation • Identify conditions that define Hardy-Weinberg equilibrium • Explain how gene flow, genetic drift, and non-random mating can lead to the evolution of populations • Describe the patterns of evolution and provide examples of each • Distinguish between the three domains all life is divided between them • Summarize how molecular evidence reveals species' relatedness • Explain what phylogenetic trees show and what evidence is used to construct them • Interpret phylogenetic trees and cladograms in order to make statements about relationships between groups of organisms

Ecology	**2 weeks**	**1. Introduction to Ecology** **2. Population Ecology**	• **BIO1.LS2.1 Populations**	• List the levels of organization recognized by ecology • Explain the difference between logistic and exponential growth patterns • Cite specific examples of each type of limiting factor and how they contribute to the carrying capacity of populations • Classify limiting factors as density dependent, density independent, biotic, or abiotic
FOURTH QUARTER				
UNIT	**PACING**	**TOPICS**	**STANDARDS**	**LEARNING OBJECTIVES**
Ecology (cont'd)	**3 weeks**	**1. Biogeochemical Cycles** **2. Ecological Succession** **3. Ecological Relationships**	• **BIO1.LS2.1 Populations** • **BIO1.LS2.2 Carbon Cycle** • **BIO1.LS2.3 Biogeochemical Cycles** • **BIO1.LS2.5 Ecological Succession**	• Describe the specific stages in each biogeochemical cycle (water, carbon, and nitrogen) • List where living organisms play a role in each biogeochemical cycle • Explain the process of ecological succession and what kinds of conditions give rise to primary vs. secondary succession • Explain how humans impact the process of ecological succession • Describe the role of pioneer species in beginning the process of primary succession, as well as a climax community at the end of both primary and secondary succession • Explain how the relationship between predators and prey generates stability over time • Explain how both organisms are affected in each type of ecological relationship and list specific examples of each type of relationship • Classify a relationship as predation, competition, or symbiosis (mutualism, commensalism, or parasitism) based on a description or illustration
Biology EOC	**3 weeks**	**1. Preparation for EOC**		