JP Knapp Early College High School
BIOLOGY PACING GUIDE

UNIT	ESSENTIAL STANDARD AND CLARIFYING OBJECTIVE	TOPIC	INSTRUCTIONAL WINDOW
		1st 9 Weeks	
Unit 1	4.1.1 4.1.3 1.1.1 1.1.2 1.2.3	**Chemistry of Life** **Cell Structure and Function**	13 days
Unit 2	1.2.1 4.2.2	**Cell Transport**	8 days
Unit 3	4.1.3 4.2.1	**Cellular Energetics**	6 days
Unit 4	1.2.2 3.1.1 3.1.2 3.1.3 4.1.2	**Cell Cycle** **Gene Expression**	12 days
		2nd 9 Weeks	
Unit 5	3.2.1 3.2.2 3.2.3	**Heredity**	12 days
Unit 6	3.4.1 3.4.2 3.4.3 3.5.1 3.5.2	**Evolution**	12 days
Unit 7	2.1.1 2.1.2 2.1.3 2.1.4 2.2.1 2.2.2	**Ecology**	10 days
Unit 8	3.3.1 3.3.2 3.3.3	**Biotechnology**	5 days
		Review	4 days

FIRST NINE WEEKS PACING CALENDAR

Day	Essential Standard and Clarifying Objective	Topic and Agenda	Unpacking
1		**First Day** Syllabus and Contract Lab Safety Google Classroom 1st Day Graffiti Ice Breaker Activity	
Unit 1: Biochemistry, Cell Structure and Function			
1	4.1.1	**Organic Molecules** PowerPoint: Organic Molecules Amoeba Sisters: Biomolecules Biomolecules foldable *I can compare the structures and functions of the major biological molecules.*	● Compare the structure and function of each of the listed organic molecules in organisms: ● Carbohydrates (glucose, cellulose, starch, glycogen) ● Proteins (insulin, enzymes, hemoglobin) ● Lipids (phospholipids, steroids) ● Nucleic Acids (DNA, RNA)
2	4.1.1	**Organic Molecules** Concept Map Activity Biochemistry Boxing (Formative) Kahoot (Formative) *I can compare the structures and functions of the major biological molecules.*	*Continued*
3	4.1.3	**Enzymes** PowerPoint: Enzymes Amoeba Sister: Enzymes Jell-O Enzyme Pre-lab questions *I can understand how enzymes work in terms of the connection between shape and function.* *Enzyme Assignment*	● Develop a cause and effect model for specificity of enzymes - the folding produces a 3-D shape that is linked to the protein function, enzymes are proteins that speed up chemical reactions (catalysts) by lowering the activation energy, are re-usable and specific, and are affected by such factors as pH and temperature. *Note: Students should understand that enzymes are necessary for all biochemical reactions and have a general understanding of how enzymes work in terms of the connection between shape and function.*
4	4.1.3	**Enzymes** Jell-O Enzyme Lab POGIL: Enzymes Kahoot (Formative)	*Continued*

5	4.1.3	**Enzymes** Enzyme Lab Data Collection Review POGIL Chemistry of Life Quiz	*Continued*
6	1.1.2	**Microscopes** PowerPoint: Microscopes Microscope Webquests *I can proficiently use a microscope.*	● Proficiently use proper light microscopic techniques as well as determine total power magnification. *Note: While students are not expected to understand how scanning and electron transmission microscopes work, they should recognize that they reveal greater detail about eukaryotic and prokaryotic cell differences.*
7	1.1.2	**Microscope** Introduction to Microscope Lab	*Continued*
8	1.1.2	**Cell Theory** **Prokaryotic vs. Eukaryotic Cells** How Small are Cells Interactive PowerPoint: Cells Venn Diagram Prokaryotic vs. Eukaryotic Handout *I can compare prokaryotic and eukaryotic cells in terms of their general structures and their degree of complexity. I can compare prokaryotic and eukaryotic cells in terms of their general structures and their degree of complexity.*	● Infer that prokaryotic cells are less complex than eukaryotic cells. ● Compare the structure of prokaryotic and eukaryotic cells to conclude the following: ● Presence of membrane bound organelles – mitochondria, nucleus, vacuole, and chloroplasts are not present in prokaryotes. Ribosomes are found in both. ● DNA and RNA are present in both, but are not enclosed by a membrane in prokaryotes. ● Contrasts in chromosome structure – circular DNA strands called plasmids are characteristic of prokaryotes. ● Contrasts in size – prokaryotic cells are smaller.
9	1.1.1	**Eukaryotic Cells (organelles)** PowerPoint: Eukaryotic Cells Cell Organelle Slides Organelle Slide Presentation Cell Organelle Quizziz *I can summarize the structure and function of organelles in eukaryotic cells.*	● Identify these cell organelles in diagrams of plant and animal cells. (middle school review) ● Explain how the structure of the organelle determines it function. (Example: folded inner membrane in mitochondria increases surface area for energy production during aerobic cellular respiration). ● Summarize how these organelles interact to carry out functions such as energy production and use, transport of molecules, disposal of waste, and synthesis of new molecules. (Example: DNA codes for proteins which are assembled by the ribosomes and used as enzymes for energy production at the mitochondria).
10	1.1.1	**Plant vs. Animal Cells** PowerPoint: Plant vs. Animal Cells Plant vs. Animal Venn	● Identify these cell organelles in diagrams of plant and animal cells. (middle school review)

		Cell Diagrams Handout Kahoot *I can compare and contrast the characteristics of plant and animal cells.*	
11	1.2.3	**Unicellular Organisms** **Cell Specialization** Cell Structure and Function Quiz PowerPoint: Cell Specialization Unicellular Organisms Activity Handout *I can explain how specific cell adaptations help cells survive in aqueous environments.*	● Explain how various structures of unicellular organisms help that organism survive. Emphasis is on contractile vacuoles, cilia, flagella, pseudopods, and eyespots. ● Summarize adaptive behaviors – examples include chemotaxis and phototaxis.
12		**Review** Jeopardy Kahoot	
13		**Unit Test/Benchmark (Summative)**	
Unit 2: Cell Transport			
1	1.2.1	**Cell Membrane Structure and Function** PowerPoint: Cell Membrane Cell Membrane Diagram Handout Egg Lab (Day 1) Naked Egg: Biology & Chemistry Science Activity Growing & Shrinking Egg - Science Experiment | Science Experiment	● Conclude how the plasma membrane structure functions. ● Explain how cells use buffers to regulate cell pH and how cells can respond to maintain temperature, glucose levels, and water balance in organisms.
2	1.2.1	**Passive Transport** Demos: Food Coloring and Febreeze PowerPoint: Passive Transport Passive Transport Handouts Kahoot (Formative) Advance Biology Super Gummy Osmosis Lab *I can compare the mechanisms of active and passive transport.*	● Explain changes in osmotic pressure that occurs when cells are placed in solutions of differing concentrations. ● Explain how cells use buffers to regulate cell pH and how cells can respond to maintain temperature, glucose levels, and water balance in organisms.
3	1.2.1 4.2.2	**Active Transport** Egg Lab (Day 2) PowerPoint: Active Transport Active Transport Handouts Kahoot (Formative) *I can compare the mechanisms of active and passive transport and*	● Compare the mechanisms of active vs. passive transport (diffusion and osmosis). ● Conclude that energy production by organisms is vital for maintaining homeostasis and that maintenance of homeostasis is necessary for life. Examples: Active transport of needed molecules or to rid the cell of toxins;

		relate it to homeostasis.	movement to avoid danger or to find food, water, and or mates; synthesizing needed molecules.
4	1.2.1	**Osmosis** Egg Lab (Day 3) Onion Cell Lab (Day 1) OSMOSIS IN ONION CELLS	● Explain changes in osmotic pressure that occurs when cells are placed in solutions of differing concentrations.
5	1.2.1	**Osmosis** Onion Cell Lab (Day 2) Kahoot Cell Transport Quiz	*Continued*
6	1.2.1	**Homeostasis** PowerPoint: Homeostasis Cell Homeostasis Virtual Lab - Activity *I can explain how homeostasis is maintained in a cell and within an organism in various environments.*	● Explain how homeostasis is maintained in a cell and within an organism in various environments (including temperature and pH).
7		**Review**	
8		**Unit Test/Benchmark (Summative)**	
Unit 3: Cellular Energetics			
1	4.1.3	**Enzyme Review** PowerPoint: Enzymes *I can understand how enzymes work in terms of the connection between shape and function.*	● Develop a cause and effect model for specificity of enzymes - the folding produces a 3-D shape that is linked to the protein function, enzymes are proteins that speed up chemical reactions (catalysts) by lowering the activation energy, are reusable and specific, and are affected by such factors as pH and temperature. *Note: Students should understand that enzymes are necessary for all biochemical reactions and have a general understanding of how enzymes work in terms of the connection between shape and function.*
2	4.2.1	**Photosynthesis** PowerPoint: Photosynthesis Photosynthesis Virtual Lab Amoeba Sister Video *I can analyze photosynthesis and cellular respiration in terms of how energy is stored, released, and transferred within and between these systems.*	● Analyze overall reactions including reactants and products for photosynthesis and cellular respiration and factors which affect their rates (amounts of reactants, temperature, pH, light, etc.).

3	1.1.1 4.2.1	**Cellular Respiration** PowerPoint: Cell Respiration Cellular Respiration Virtual Lab Photosynthesis vs. Cellular Respiration Handout Kahoot	● Explain how the structure of the organelle determines it function. (Example: folded inner membrane in mitochondria increases surface area for energy production during aerobic cellular respiration). ● Analyze overall reactions including reactants and products for photosynthesis and cellular respiration and factors which affect their rates (amounts of reactants, temperature, pH, light, etc.). ● Compare these processes with regard to efficiency of ATP formation, the types of organisms using these processes, and the organelles involved. (Anaerobic respiration should include lactic acid and alcoholic fermentation.)
4	4.2.1	**Aerobic vs Anaerobic Respiration** PowerPoint: Anaerobic Respiration/Aerobic vs Anaerobic Respiration Fermentation Lab *I can compare aerobic and anaerobic respiration.*	● Compare these processes with regard to efficiency of ATP formation, the types of organisms using these processes, and the organelles involved. (Anaerobic respiration should include lactic acid and alcoholic fermentation.) *Note: Instruction should include the comparison of anaerobic and aerobic organisms*.
5		**Review** Photosynthesis and Respiration Quiz	
6		**Unit 3 Test/Benchmark**	
Unit 4: Cell Cycle and Gene Expression			
1	1.2.2 3.1.1	**Cell Cycle** PowerPoint Cell Cycle Cell Cycle Coloring Worksheet Cell Cycle Kahoot *Cell Energy Cycle Gizmo* *I can outline the cell cycle.*	● Outline the cell cycle – Growth1, Synthesis, Growth2, Mitosis, and Cytokinesis. Replication occurs during the S phase of the cell cycle and allows daughter cells to have an exact copy of parental DNA.
2	1.2.2 3.1.1	**Cancer and Mitosis** Cell Cycle Bellringer PowerPoint: Cancer Biointeractive: The Eukaryotic Cell Cycle and Cancer Amoeba Sisters PowerPoint: Mitosis Mitosis Mix Up Activity I *can analyze how cells grow and reproduce in terms of interphase, mitosis, and cytokinesis.*	● Recognize mitosis as a part of asexual reproduction. (middle school review) ● Organize diagrams of mitotic phases and describe what is occurring throughout the process. ● Infer the advantages (injury repair) and disadvantages (cancer) of the overproduction, underproduction or production of proteins at the incorrect times

		I can understand that cancer is a disease of mitosis.	
3	1.2.2	**Mitosis** Mitosis Google Form Bellringer Onion Root Tip Lab Kahoot	*Continued*
4		Cell Cycle Quiz DNA Reading Comprehension Handout	*Continued*
5	3.1.1	**DNA Structure** PowerPoint: DNA Structure Amoeba Sister: DNA, Chromosomes, Genes, and Traits DNA Cut out Activity *I can explain the double-stranded, complementary nature of DNA.*	● The structure of DNA is a double helix or "twisted ladder" structure. The sides are composed of alternating phosphate-sugar groups and "rungs of the DNA ladder" are composed of complementary nitrogenous base pairs (always adenine, A, to thymine, T, and cytosine, C, to guanine, G) joined by weak hydrogen bonds. ● The sequence of nucleotides in DNA codes for proteins which is central key to cell function and life. Replication occurs during the S phase of the cell cycle and allows daughter cells to have an exact copy of parental DNA.
6	3.1.1	**DNA Replication** DNS Structure Bellringer PowerPoint: DNA Replication Amoeba Sisters: DNA Replication POGIL DNA Structure and Replication Building DNA and DNA Replication (Extension) *I can build a model that illustrates DNA Replication.*	*Continued*
7	3.1.2	**RNA and Protein Synthesis (Transcription)** DNA Replication Bellringer PowerPoint Lecture RNA and Transcription Amoeba Sister: RNA vs. DNA RNA Transcription Practice Handout *I can explain how DNA and RNA code for proteins and determine traits.*	● Explain the process of protein synthesis: ● Transcription that produces an RNA copy of DNA ● mRNA traveling to the ribosome (rRNA)
8	3.1.2	**Protein Synthesis (Translation)** PowerPoint: Translation Transcription and Translation Practice Handout	● Explain the process of protein synthesis: ● mRNA traveling to the ribosome (rRNA) ● Translation – tRNA supplies appropriate amino acids Amino acids are linked by peptide

		Alien Encounters Handout *I can explain how DNA and RNA code for proteins and determine traits.*	bonds to form polypeptides. Polypeptide chains form protein molecules. Proteins can be structural (forming a part of the cell materials) or functional (hormones, enzymes, or chemicals involved in cell chemistry). ● Interpret a codon chart to determine the amino acid sequence produced by a particular sequence of bases. ● Explain how an amino acid sequence forms a protein that leads to a particular function and phenotype (trait) in an organism.
9	3.1.2	**Protein Synthesis (continued)** Protein Synthesis Bellringer Alien Encounters Activity DNA Replication and Protein Synthesis Quiz *I can summarize the relationship among DNA, proteins and amino acids.*	*Continued*
10	3.1.3	**Mutations** PowerPoint: Mutations DNA Mutations Practice Handout DNA Mutations Simulations 1 and 2 *I can understand that mutations are changes in DNA coding.* *I can explain how mutations in DNA lead to changes in function and phenotype.*	● Understand that mutations are changes in DNA coding and can be deletions, additions, or substitutions. ● Mutations can be random and spontaneous or caused by radiation and/or chemical exposure.
11		**Review**	
12		**Unit 4 Test/Benchmark**	

SECOND 9 WEEKS OF PACING CALENDER

Day	Essential Standard and Clarifying Objective	Topic and Agenda	Unpacking
Unit 5: Heredity			
1	3.2.1	**Meiosis vs. Mitosis** **PowerPoint: Mitosis Review and Meiosis** Amoeba Sisters Video Mitosis vs. Meiosis Chart Handout	● Explain the role of meiosis in sexual reproduction and genetic variation: ● Compare meiosis and mitosis including type of reproduction (asexual or sexual), replication and separation of DNA and cellular material, changes in chromosome number, number of cell divisions, and number of cells

		I can compare mitosis and meiosis.	produced in a complete cycle.
2	3.2.1	**Genetic Diversity** PowerPoint: Genetic Diversity Meiosis Pop Bead Investigation *I can explain the role of meiosis in sexual reproduction and genetic variation.*	● Explain the role of meiosis in sexual reproduction and genetic variation: ● Recall the process of meiosis and identify process occurring in diagrams of stages. (middle school review) Note: Students are not expected to memorize the names of the steps or the order of the step names. ● Infer the importance of the genes being on separate chromosomes as it relates to meiosis. ● Explain how the process of meiosis leads to independent assortment and ultimately to greater genetic diversity. ● Exemplify sources of genetic variation in sexually reproducing organisms including crossing over, random assortment of chromosomes, gene mutation, nondisjunction, and fertilization.
3	3.2.2	**Genetic Diversity (*continued*)** Meiosis Pop Bead Investigation Kahoot Meiosis Quiz	*Continued*
4	3.2.2	**Simple Genetics (monohybrid crosses)** PowerPoint: Simple Genetics Heredity Simulation Handout SpongeBob Genetics Handout Genetic Diversity and Karyotypes Handout *I can interpret Punnett Squares to determine phenotypic and genotypic ratios.*	● Interpret Punnett squares (monohybrid only) to determine genotypic and phenotypic ratios. Understand that dominant alleles mask recessive alleles. ● Determine parental genotypes based on offspring ratios. ● Interpret karyotypes (gender, and chromosomal abnormalities). ● Recognize a variety of intermediate patterns of inheritance (codominance and incomplete dominance). ● · Recognize that some traits are controlled by more than one pair of genes and that this pattern of inheritance is identified by the presence of a wide range of phenotypes (skin, hair, and eye color).
5	3.2.2	**Genetic Disorders** Simple Genetics Bellringer Sickle Cell Article with Questions Complete Genetic Disorder Project	● Interpret autosomal inheritance patterns: sickle cell anemia including the relationship to malaria, cystic fibrosis (recessive heredity), and Huntington's disease (dominant heredity). ● Understand human sex chromosomes and interpret crosses involving sex-linked traits 5(color-blindness and hemophilia). Students s6hould understand why males are more likely to express a sex-linked trait.
6	3.2.2	**Genetic Disorders**	*Continued*

		Presentations	
7	3.2.2	**Incomplete vs. Codominance (Blood typing)** PowerPoint: Incomplete and Codominance Incomplete and Codominance Practice Handout PowerPoint: Blood Typing Video (Amoeba sisters) Blood Typing Practice Handout Blood Type Pedigree Investigation *I can recognize a variety of intermediate patterns of inheritance.* *I can solve and interpret codominant crosses involving multiple alleles including blood typing problems.*	● Recognize a variety of intermediate patterns of inheritance (codominance and incomplete dominance). ● Solve and interpret codominant crosses involving multiple alleles including blood typing problems. (Blood Types: A, B, AB and O and Alleles: IA , IB , and i). Students should be able to determine if parentage is possible based on blood types.
8		**Complete vs. Incomplete/Codominance** Blood typing Bellringer Punnett Square Project Handout	*Continued*
9		**Sex Linked Traits and Pedigrees** PowerPoint: Sex linked traits Sex-Linked Traits Handout Sex-linked Alien Handout PowerPoint: Pedigrees Pedigree Practice Pedigree Charts Handout *I can interpret sex-linked crosses and pedigrees to identify inheritance factors for particular individuals.*	● Understand human sex chromosomes and interpret crosses involving sex-linked traits (color-blindness and hemophilia). Students should understand why males are more likely to express a sex-linked trait. Interpret phenotype pedigrees to identify the genotypes of individuals and the type of inheritance.
10		Harry Potter Pedigree Handout Punnett Square and Pedigree Quiz	*Continued*
11		**Review**	
12		**Unit 5 Test/Benchmark**	
Unit 6: Evolution			
1	3.4.1	**Evolution, Endosymbiotic Theory, and Evidence of Evolution** PowerPoint: Evidence of Evolution	● Summarize the hypothesized early atmosphere and experiments that suggest how the first “cells” may have evolved and how early conditions affected the type of organism that developed (first anaerobic and prokaryotic, then

		Evidence of Evolution Handout How Wolves Became Dogs Case Study *I can generalize what different pieces of evidence can tell us about evolution.*	photosynthetic, then eukaryotic, then multicellular). ● Summarize how fossil evidence informs our understanding of the evolution of species and what can be inferred from this evidence. ● Generalize what biochemical (molecular) similarities tell us about evolution. ● Generalize what shared anatomical structures (homologies) tell us about evolution
2	3.4.3	**Disease Agents In Natural Selection** PowerPoint: Natural Selection, Antibiotic Resistant Bacteria, and Types of Immunity Amoeba Sisters: Antibiotics, antivirals and vaccines Antibiotic Resistance article and CER *I can explain how various disease agents can influence natural selection.*	● Develop a cause and effect model for the role of disease agents in natural selection including evolutionary selection of resistance to antibiotics and pesticides in various species, passive/active immunity, antivirals and vaccines.
3	3.4.2	**Natural Selection and Adaptations** Natural Selection Demo Adaptation Information and kiwi Handout Biointeractive: Mouse Color Variation *I can explain how natural selection influences the changes in species over time.*	● Develop a cause and effect model for the process of natural selection: ● Species have the potential to increase in numbers exponentially. ● Populations are genetically variable due to mutations and genetic recombination. ● Changing environments select for specific genetic phenotypes. ● Those organisms with favorable adaptations survive, reproduce and pass on their alleles. ● The accumulation and change in favored alleles leads to changes in species over time. ● Illustrate the role of geographic isolation in speciation.
4	3.4.2	**Natural Selection and Adaptations (*continued*)** Natural Selection Virtual Lab *I can explain how natural selection influences the changes in species over time.*	*Continued*
5	3.4.2	**Speciation and Types of Natural Selection** PowerPoint: Types of Natural Selection Types of Natural Selection Handout *I can explain how natural selection influences the changes*	*Continued*

		in species over time.	
		Speciation, Coevolution, Geographic, and Genetic Drift PowerPoint: Speciation, Coevolution, and Genetic Drift POGIL: Selection and Speciation *I can explain the theory of evolution by natural selection as a mechanism for how species change over time.* *I can illustrate the role of geographic isolation in speciation.*	*Continued*
6	3.5.1 3.5.2	**Classification and Dichotomous keys** PowerPoint: Classification Systems, Scientific Naming, and Dichotomous Keys Dichotomous Key Handouts (Common organisms, Dinosaurs, and Sharks) *I can explain the historical development and changing nature of classification systems.* *I can classify organisms using a dichotomous key.*	● Explain the historical development and changing nature of classification systems. ● Analyze the classification of organisms according to their evolutionary relationships (including dichotomous keys and phylogenetic trees).
7	3.5.2	**Phylogenic trees** PowerPoint: Phylogenic Trees Dog Phylogenic Tree Handout Constructing Phylogenic Tree Handout	● Compare organisms on a phylogenetic tree in terms of relatedness and time of appearance in geologic history.
8	3.5.2	**Phylogenic trees (*continued*)** Constructing Phylogenic Tree Handout *I can compare organisms on a phylogenetic tree in terms of relatedness and time of appearance in geologic history.*	*Continued*
9	3.5.2	**Cladograms** **PowerPoint: Cladograms** What is a Cladogram Handout	*Continued*
11		**Extra Day** Complete Assignments Evolution Quiz	
12		**Review**	
13		**Unit 6 Test/Benchmark**	

Unit 7 Ecology			
1	2.1.1	**Energy Flow in Ecosystems** Lion King Clip PowerPoint: Energy Flow in Ecosystems Energy Through and Ecosystem Handout Ecological Pyramid Handout *I can analyze flow of energy through ecosystems.*	● Analyze energy pyramids for direction and efficiency of energy transfer. ● Living systems require a continuous input of energy to maintain organization. The input of radiant energy which is converted to chemical energy allows organisms to carry out life processes. ● Within ecosystems energy flows from the radiant energy of the sun through producers and consumers as chemical energy that is ultimately transformed into heat energy. Continual refueling of radiant energy is required by ecosystems.
2	2.1.1	**Energy Flow in Ecosystems** Food Chain Lab Got Energy? Food Web Lab	*Continued*
3	2.1.1	**Cycles of Matter** PowerPoint: Carbon Cycle Carbon Cycle Handout PowerPoint: Nitrogen Cycle Nitrogen Cycle Handout Amoeba Sisters Carbon and Nitrogen Cycle Recap Nitrogen Cycle Activity *I can deconstruct the carbon cycle and identify factors that might impact the carbon cycle.*	● Deconstruct the carbon cycle as it relates to photosynthesis, cellular respiration, decomposition and climate change. ● Summarize the nitrogen cycle (including the role of nitrogen fixing bacteria) and its importance to synthesis of proteins and DNA. Identify factors that influence climate such as: Greenhouse effect (relate to carbon cycle and human impact on atmospheric CO2) ● Natural environmental processes (relate to volcanic eruption and other geological processes) ● Explain the parts of the carbon and nitrogen cycles.
4	2.1.2	**Adaptations** PowerPoint: Survival and Reproductive Success Learned vs. Innate Behavior Handout Plant Adaptation Handout *I can analyze how various organisms accomplish life functions through adaptations within particular environments.*	● Analyze how various organisms accomplish life functions through adaptations within particular environments (example: water or land) to ensure survival and reproductive success. ● Relate prior understanding of survival and reproductive success to evidence of variations observed in species in three areas: ● behavioral adaptations – suckling, taxes/taxis, migration, estivation, hibernation, habituation, imprinting, classical conditional, and trial and error learning ● structural adaptations–nutrition, respiration, transport and excretion mechanisms, camouflage, movement. ● Reproductive adaptations– sexual versus asexual, eggs, seeds, spores, placental, types of fertilization.
5	2.1.2	**Adaptations** Behavioral Adaptation Handout Student Organisms Adaptation	*Continued*

		Activity *I can analyze how various organisms accomplish life functions through adaptations within particular environments.*	
6	2.1.3	**Ecological Relationships** PowerPoint: Relationships in Communities and Organism Interactions Symbiotic Relationship Handout Predator/Prey Graphing Handout Nature: Symbiotic Strategies Handout *I can explain various ways organisms interact with each other and with their environments resulting in stability within ecosystems.*	● Identify and describe symbiotic relationships such as mutualism and parasitism. (middle school review) ● Exemplify various forms of communication and territorial defense including communication within social structure using pheromones (Examples: bees, ants, termites), courtship dances, territorial defense (Example: fighting fish). ● Explain patterns in predator /prey
7	2.1.4	**Population Dynamics** PowerPoint: Population Dynamics, Limiting Factors, and types of Population Graphs Human Population Handout Population Ecology Graph Handout *I can generalize that populations may fluctuate depending on the limiting factors influencing those populations.* *I can interpret various types of population graphs.*	● Generalizing that although some populations have the capacity for exponential growth, there are limited resources that create specific carrying capacities and population sizes are in a dynamic equilibrium with these factors. (e.g. food availability, climate, water, territory). ● Interpret various types of population graphs – human population growth graphs indicating historical and potential changes, factors influencing birth rates and death rates, and effects of population size, density and resource use on the environment. ● Explain how disease can disrupt ecosystem balance. (Examples: AIDS, influenza, tuberculosis, Dutch Elm Disease, Pfiesteria, et
8	2.2.1 2.2.2	**Human Impact on Ecosystems** PowerPoint: Human Impact on Natural Resources and Biomagnification Biomagnification Lab APA Format Human Impact Research Paper (Assign at the beginning of the unit) *I can infer how human activities may impact the environment.* *I can explain factors that impact North Carolina ecosystems.* *I can explain the impact humans have on natural resources.*	● Summarize how humans modify ecosystems through population growth, technology, consumption of resources and production of waste. ● Interpret data regarding the historical and predicted impact on ecosystems and global climate. ● Explain factors that impact North Carolina ecosystems. (Examples: acid rain effects in mountains, beach erosion, urban development in the Piedmont leading to habitat destruction and water runoff, waste lagoons on hog farms, Kudzu as an invasive 9plant, etc.). ● Explain the impact of humans on natural resources (e.g. resource depletion, deforestation, pesticide use and bioaccumulation) ● Exemplify conservation methods and stewardship.

9		**Review**	
10		**Unit 7 Test/Benchmark**	
Unit 8: Biotechnology			
1	3.3.1 3.3.2 3.3.3	**Gel Electrophoresis** PowerPoint: Gel Electrophoresis Amoeba Sisters Video Gel Electrophoresis Digital Lab *I can summarize the process of gel electrophoresis as a technique used to separate molecules based on size.*	● Summarize the process of gel electrophoresis as a technique to separate molecules based on size. Students should learn the general steps of gel electrophoresis – using restriction enzymes to cut DNA into different sized fragments and running those fragments on gels with longer fragments moving slower than faster ones. · Interpret or "read" a gel. ● Exemplify applications of DNA fingerprinting - identifying individuals; identifying and cataloging endangered species.
2	3.3.1	**Gel Electrophoresis** Introductory Gel Electrophoresis Lab (Carolina Biological) *I can summarize the process of gel electrophoresis as a technique used to separate molecules based on size.*	● · Summarize the process of gel electrophoresis as a technique to separate molecules based on size. Students should learn the general steps of gel electrophoresis – using restrictions enzymes to cut DNA into different sized fragments and running those fragments on gels with longer fragments moving slower than faster ones.
3		**Transgenic Organisms** PowerPoint: Transgenic Organisms Transgenic Organism Research *I can summarize how transgenic organisms are engineered to benefit society.*	● Generalize the applications of transgenic organisms (plants, animals, & bacteria) in agriculture and industry including pharmaceutical applications such as the production of human insulin.
4		**Bacterial Transformation and Human Genome Project** PowerPoint: Bacterial Transformation and Human Genome Project Transformation Activity Assignment *I can identify reasons for establishing the Human Genome Project.*	● Summarize the steps in bacterial transformation (insertion of a gene into a bacterial plasmid, getting bacteria to take in the plasmid, selecting the transformed bacteria, and producing the product). ● Identify the reasons for establishing the Human Genome Project. Recognize that the project is useful in determining whether individuals may carry genes for genetic conditions and in developing gene therapy. Evaluate some of the science of gene therapy. (e.g. Severe Combined Immunodeficiency and Cystic Fibrosis)
5		**Ethics** Lead a Structured Discussion using Scenarios Handout Open Notebook Unit 8 Test *I can evaluate some of the ethical*	● Critique the ethical issues and implications of genomics and biotechnology (stem cell research, gene therapy and genetically modified organisms).

		issues surrounding the use of DNA technology.	
Review			
1		**Module 1 Review**	
2		**Module 2 Review**	
3		**Module 3 Review**	
4		**Module 4 Review**	