Hamburg Area School District

Name of Course: Advanced Placement Biology **Department:** Science

Texts and Resources:

Biology

Author: Campbell and Reece Publisher: Benjamin Cummings Year: 2002

Student Study Guide for <u>Biology</u> Student Laboratory Procedural Manual Student Laboratory Notebook **Grade Level:** *12* **Instructional Time: Length of Course:** *Full Year* **Period Per Cycle:** *8* **Length of Period:** *42 Minutes*

Assessments:

Homework/Problem Sets Chapter quizzes Unit Essays Laboratory Notebooks Lab Quizzes Scientific Papers Independent Projects Chapter Tests Forensic Case Study

Course Name: Advanced Placement Biology Unit: Evolution

Time Line: 3-4 Cycles

Essential Content/ Essential Questions	Performance Objectives	Standards/Anchors
	1. Understand the mechanism by which a species	S.11.A.1.1.1
	changes over time.	S.11.A.1.1.2
How does evolution unify Biology?	2. Explain Darwin's idea of natural selection.	S.11.A.3.2.1
	3. Analyze how differential reproductive success	S.11.B.2.1.1
	influences natural selection.	S.11.B.2.1.2
		S.11.B.2.1.3
		S.11.B.2.1.4
		S.11.B.2.2.3
	1. Compare and contrast modes of speciation.	S.11.A.1.1.1
	2. Identify the requirements for Hardy-Weinberg.	S.11.A.1.1.2
How do species change over time?	3. Use the Hardy-Weinberg to predict allele	S.11.A.3.2.1
	frequencies for populations.	S.11.B.2.1.1
	4. Evaluate evidence for evolution.	S.11.B.2.1.2
	5. Predict and evaluate allele frequency change	S.11.B.2.1.3
	through successive generations.	S.11.B.2.1.4
		S.11.B.2.2.3

Course Name: Advanced Placement Biology Unit: Ecology

Time Line: 4 cycles

Essential Content/ Essential Questions	Performance Objectives	Standards/Anchors
How do interactions between organisms influence the survival of a species?	 Understand types and explanations for animal behavior. Predict how behavior enables survival. Assess the evolutionary advantage of behavior. Design an experiment to evaluate behavior in isopods. 	S.11.A.1.1.5 S.11.A.2.1.1 S.11.A.2.1.3 S.11.A.2.1.5 S.11.A.3.1.3 S.11.A.3.2.1 S.11.B.3.1.2 S.11.B.3.1.5
What interactions exist within an ecosystem?	 Examine the role of niches, resources, competition, symbiosis and interdependency and discuss examples of each. Describe the effect predator-prey relationships have on population stability. 	S.11.B.3.1.1 S.11.B.3.1.2 S.11.B.3.1.3 S.11.B.3.1.4 S.11.B.3.1.5
What influences population change over time?	 Model the effects of natural selection on a sample population. Complete a cemetery study of Hamburg's population from 1800-1899. 	S.11.A.1.2.1 S.11.A.1.3.1 S.11.A.2.1.5 S.11.A.3.1.3.
What requirements are needed by ecosystems and how are they modified over time?	 Analyze and predict the effects of environmental disturbances. Discuss the characteristics of terrestrial and aquatic ecosystems. Assess modes of succession. Compare and contrast nutrient and energy cycles. Evaluate the requirements for a healthy ecosystem, specifically the relationship between dissolved oxygen levels and aquatic life. 	S.11.A.1.3.2 S.11.A.2.1.4 S.11.A.2.1.5 S.11.A.3.1.1 S.11.A.3.1.3 S.11.A.1.3.3 S.11.B.3.1.1 S.11.B.3.1.2 S.11.B.3.1.3

Course Name: Advanced Placement Biology Unit: Biochemistry

Time Line: 3 cycles

Essential Content/ Essential Questions	Performance Objectives	Standards/Anchors
What role do the four macromolecules play in metabolism, homeostasis and human disease?	 Identify carbon based functional groups and their chemical properties. Compare and contrast carbohydrates, lipids, nucleic acids and proteins. Assess the relationship between structure and function in enzymes. Evaluate the effects of time, temperature and concentration on reaction rates. Discuss the role of enzymes in homeostasis. Assess various human disorders related to the metabolism of biological molecules. Differentiate between hydrolysis and condensation reactions. 	S.11.A.3.3.1 S.11.A.1.3.1 S.11.A.1.3.2 S.11.A.2.1.3 S.11.A.2.1.4 S.11.A.2.1.5 S.11.B.1.1.1 S.11.C.1.1.2 S.11.C.1.1.3 S.11.C.2.1.2.
How is water essential for life on Earth?	 Explain the special properties of water and their relationship to homeostasis. Discuss water's role in stabilizing ecosystems, biomes and the Earth. 	S.11.C.1.1.2 S.11.C.1.1.3

Course Name: Advanced Placement Biology Unit: Cells and Cellular Energy

Time Line: 4-5 cycles

Essential Content/ Essential Questions	Performance Objectives	Standards/Anchors
How do various cell types compare in their structure and function?	 Review prokaryotic and eukaryotic cell organelles. Discuss the evolutionary history of cell organelles. Describe the relationship between structure and function of the cell membrane. 	S.11.B.1.1.1 S.11.B.1.1.2 S.11.B.2.1.1
How do cells communicate with their environment?	 Examine the relationship between cell size and diffusion rates. Evaluate and observe osmosis and diffusion rates through a semi-permeable membrane and living plant cells. Compare and contrast the three types of cell-cell junctions. Discuss the role of receptor proteins and signal molecules such as hormones. 	S.11.A.1.3.1 S.11.A.2.1.3 S.11.A.2.1.5 S.11.A.3.1.1 S.11.A.3.1.2 S.11.B.1.1.1 S.11.B.1.1.3
How do cells regulate growth, division and the distribution of genetic material?	 Compare and contrast mitosis and meiosis. Differentiate between mitosis and meiosis in plant and animal cells. Examine the mechanism of eukaryotic genome control. Evaluate the relationship between cancer and the cell cycle. Assess the effects of chromosome and gene mutations. Examine the exchange of genetic material through crossing over in fungal cells. 	S.11.A.3.1.1 S.11.A.3.1.3 S.11.B.1.1.1 S.11.B.1.1.3 S.11.B.2.1.2 S.11.B.2.2.2

Course Name: Advanced Placement Biology Unit: Cells and Cellular Energy

Time Line: 4-5 cycles

Essential Content/ Essential Questions	Performance Objectives	Standards/Anchors
How do cells obtain energy for life processes?	 Examine energy requirements for plant and animal cells. Discuss the steps of photosynthesis and cellular respiration. Evaluate the effects of temperature and germination on the respiration rates of peas. Assess the effect of light intensity on photosynthesis rates. Examine the evolutionary development and advantages of cellular respiration and photosynthesis. Analyze photosynthetic adaptations made by plants. Relate mitochondria and chloroplast structure to their function in cell respiration and photosynthesis. 	S.11.A.1.1.5 S.11.A.1.3.1 S.11.A.1.3.2 S.11.A.2.1.3 S.11.A.2.1.5 S.11.A.3.1.2 S.11.B.1.1.1 S.11.B.1.1.3 S.11.B.2.1.1 S.11.C.2.1.2

Course Name: Advanced Placement Biology Unit: DNA, Heredity and DNA Technology

Time Line: 6 cycles

Essential Content/ Essential Questions	Performance Objectives	Standards/Anchors
	1. Explain Mendel's laws of segregation and	S.11.A.1.1.1
	independent assortment.	S.11.A.1.1.5
How do organisms inherit and express their traits?	2. Construct and analyze monohybrid and dihybrid	S.11.A.2.1.1
	crosses.	S.11.A.2.1.3
	3. Calculate outcomes of genetic crosses using the	S.11.A.2.1.4
	rules of probability.	S.11.A.2.1.5
	4. Discuss how mutation is a mechanism for	S.11.A.3.1.3
	evolution.	S.11.A.3.2.1
	5. Evaluate unique inheritance patterns such as sex-	S.11.B.2.1.2
	linkage, epistasis, incomplete dominance, etc.	S.11.B.2.1.3
	6. Study autosomal and sex-linked traits in several	S.11.B.2.2.1
	generations of Drosophila, calculate genetic ratios	S.11.B.2.2.3
	and defend findings in a scientific paper.	
	7. Discuss the cause and effect of various genetic	
	diseases.	
	8. Calculate gene distances on chromosomes using	
	recombination frequencies.	
	1. Review the structure of DNA and replication.	S.11.B.2.1.2
How is expression of the eukaryotic genome	2. Discuss the role of enzymes in DNA replication.	S.11.B.2.1.3
controlled?	3. Examine the levels of chromatin packaging.	S.11.B.2.2.1
	4. Describe the steps of protein synthesis.	S.11.B.2.2.3
	5. Evaluate the effect of mutations on the synthesis of proteins.	
	 Evaluate pre and post transcriptional/translational controls in eukarvotes. 	
	7. Discuss genomic control in prokarvotes including	
	the lac-operon.	

Course Name: Advanced Placement Biology Unit: DNA, Heredity and DNA Technology

Time Line: 6 cycles

Essential Content/ Essential Questions	Performance Objectives	Standards/Anchors
	1. Describe the levels of embryonic development and	S.11.B.1.1.1
How do genes direct embryonic development?	the genes that control each phase.	S.11.A.3.3.1
	2. Explain the role of protein gradients in	S.11.B.1.1.2
	development.	S.11.B.1.1.3
	 Evaluate the known development of common organisms. 	S.11.B.2.1.1
	4. Discuss the preservation of developmental genes	
	in evolution.	
	5. Describe the results of normal and abnormal	
	functioning of developmental genes.	
	1. Explain the function and benefit of restriction	S.11.A.1.1.4 S.11.B.2.1.1
What current DNA applications are in use today?	enzymes.	S.11.A.1.3.1 S.11.B.2.1.2
	2. Construct restriction enzyme maps.	S.11.A.2.1.2
	3. Evaluate the evolution of antibiotic resistance	S.11.A.2.1.3
	through bacterial transformation.	S.11.A.2.1.5
	4. Construct and analyze a sample gel electrophoresis	S.11.A.2.2.1
	using DNA cut with restriction enzymes.	S.11.A.3.2.1

Course Name: Advanced Placement Biology Unit: Plant Structure and Function

Time Line: 3 cycles

Essential Content/ Essential Questions	Performance Objectives	Standards/Anchors
How can we explain the evolutionary success of plants on land?	 Trace the evolutionary path of plants from algae to angiosperms. Discuss the adaptations needed by plants to colonize land. Review photosynthesis. Describe transpiration as it affects the Earth's climate. Design and evaluate an experiment that examines the effects of wind, humidity, temperature and leaf size on transpiration rates. Examine the effects of hormones (B-9 and gibberillin) on plant growth. Describe the structure of the root, stem and leaf and explain how each contributes to homeostasis of the plant. Relate reproductive techniques to a plant's probability of the plant. 	S.11.A.2.1.3 S.11.A.2.1.5 S.11.A.3.1.3 S.11.B.1.1.1 S.11.B.1.1.2 S.11.B.2.1.1 S.11.B.3.1.2 S.11.C.2.1.2
	evolutionary success.	

Course Name: Advanced Placement Biology Unit: Organism Diversity, Physiology and Homeostasis

Time Line: 3 cycles

Essential Content/ Essential Questions	Performance Objectives	Standards/Anchors
How can we explain the large diversity and success of animals?	 Examine the characteristics of the three domains of life. Evaluate adaptations that have ensured organism survival. Examine representative organisms of the major animal phyla. Examine the evolutionary development of complex organs such as the heart and eye. 	S.11.A.3.1.4 S.11.B.1.1.1 S.11.A.3.3.1 S.11.B.1.1.2 S.11.B.2.1.1
	development.	
How do organisms maintain stability in unstable environments?	 Evaluate the relationship between the nervous, endocrine, circulatory and respiratory systems and homeostasis. Discuss feedback mechanism and muscle coordination in humans. Examine the immune response in humans. Experiment with Daphnia and predict how they maintain circulatory homeostasis while their external environment changes. 	S.11.A.1.1.5 S.11.A.1.3.1 S.11.A.2.1.3 S.11.A.2.1.5 S.11.A.3.1.3 S.11.A.3.1.4 S.11.B.1.1.1 S.11.A.3.3.1 S.11.B.1.1.2 S.11.B.2.1.1

Course Name: Advanced Placement Biology Unit: Forensic Entomology

Time Line: 4 cycles

Essential Content/ Essential Questions	Performance Objectives	Standards/Anchors
How are biological tools capable of solving modern day crimes?	 Describe basic insect morphology and developmental stages. Distinguish between insect classes. Collect and analyze insect and weather data to determine a Post-Mortem Interval for a pig carcass. Evaluate findings and defend the estimated PMI in a scientific paper. 	S.11.A.1.1.4 S.11.A.1.1.5 S.11.A.1.2.1 S.11.A.1.3.1 S.11.A.1.3.2 S.11.A.2.1.3 S.11.A.2.1.4 S.11.A.2.1.5 S.11.A.2.2.2 S.11.B.1.1.2 S.11.B.3.1.3 S.11.B.3.1.5