

DEPARTMENT: SCIENCE	COURSE TITLE. ADVANCED PLACEMENT BIOLOGY / 2 TRIMESTERS COURSE NUMBER: 229
GRADE(S): 11/12	PRE-REQUISITES (IF ANY): SUCCESSFUL COMPLETION OF BIOLOGY AND CHEMISTRY (HONORS RECOMMENDED FOR BOTH)

UNIT	LENGTH	CONTENT	SKILLS	METHODS OF ASSESSMENT	FRAMEWORK STRAND(S) & STANDARD(S)
SUMMER UNIT: Taxonomic Classification	Over the Summer + 3 days	<ul style="list-style-type: none"> • Animal diversity: classification, phylogeny, survey of acoelomate, pseudocoelomate, protosome and deuterostome phyla • Virus structure and function • Ways to classify organisms • The domain system • Phylogenetic trees 	<p>Students will:</p> <ul style="list-style-type: none"> • Understand the approaches of pheneticists and cladists to classification. • Use a dichotomous key to identify organisms. • Construct dichotomous keys. • Construct a phylum chart. • Draw inferences. • Construct an evolutionary cladogram. • Extract information from written sources. • Interpret diagrams. 	<ul style="list-style-type: none"> • Genetic Drift Lab • Survey of Kingdoms Monera, Protista, Fungi, and Animalia Lab • Shark Key • Construction of dichotomous key • Buncus Key • Summer Work Portfolio Assessment • Unit Exam 	Evolution and Biodiversity: 5.1, 5.2, 5.3
UNIT 1: Ecology and Animal Behavior	7 days	<ul style="list-style-type: none"> • Population dynamics, biotic potential, limiting factors • Interactions between species • Ecosystems, energy flow, productivity • Biological communities, succession, biomes • Biogeochemical cycles, future of the biosphere • Animal behavior 	<p>Students will:</p> <ul style="list-style-type: none"> • Complete independent summer reading. • Extract information from written sources. • Construct and interpret graphs. • Demonstrate understanding of mathematical modeling. • Make essay outlines. • Utilize lab report format • Make and record observations in research journal. • Practice lab safety. 	<ul style="list-style-type: none"> • AP Bio Lab #12: Dissolved Oxygen and Aquatic Primary Productivity • AP Bio Lab #11: Behavior: Habitat Selection • Writing assessment • Essay Outlines • Unit exam 	Ecology: 6.1, 6.2, 6.3, 6.4, 6.5

<p>UNIT 2: Chemistry of Life</p>	<p>6 days</p>	<ul style="list-style-type: none"> Review biological chemistry, atoms, molecules, bonding, pH, carbon chemistry, functional groups Review hydrogen bonding and significance of water Review carbohydrates, lipids, proteins, nucleic acids Review dehydration synthesis, hydrolysis Free-energy changes, equilibrium Enzymes, coenzymes, cofactors, activity rates, regulation Evolution of biologically significant molecules 	<p>Students will:</p> <ul style="list-style-type: none"> Apply scientific method to problem solving. Construct models. Recognize science as an ongoing process with continual revision based on interpretation of observations and experimental data. Relate structure to function. Extract information from written sources. Design an experiment. Construct and interpret graphs. Make essay outlines. Practice lab safety. 	<ul style="list-style-type: none"> Review Chemical testing of biologically significant molecules AP Lab #2: Enzyme Catalysis Chemistry of Protein Structure - Gel Electrophoresis Activity Take-home Quiz Essay outlines Unit Portfolio Assessment Unit Exam 	<p>The Chemistry of Life: 1.1, 1.2, 1.3, 1.4, 1.5 Genetics:3.8 Scientific Inquiry Skills</p>
<p>UNIT 3: Cell Structure and Function</p>	<p>9 days</p>	<ul style="list-style-type: none"> Review prokaryotic and eukaryotic cells Differentiate plant, animal and fungal cells Review structure and function of organelles Subcellular components of motility, cytoskeleton Diffusion and osmosis Osmotic balance and water potential Cell membrane structure and function Passive and active transport mechanisms Cell communication; connections between cells Mitosis and the cell cycle; cytokinesis Review identification of stages of mitosis Surface area to volume ratio 	<p>Students will:</p> <ul style="list-style-type: none"> Use and care for microscopes correctly. Estimate size of microscopic specimens. Demonstrate understanding of slide preparation techniques. Perform unit conversion. Make detailed observations. Make detailed lab drawings. Develop models and recognize their limitations. Relate structure to function. Extract information from written sources. Interpret diagrams. Make essay outlines. Practice lab safety. 	<ul style="list-style-type: none"> Review basic microscope skills AP Lab #1: Diffusion and Osmosis Survey of Kingdoms Monera and Protista lab Plasmolysis Lab Take-home Quiz Ap Bio Lab #3: Mitosis Essay outlines Unit Portfolio Assessment Unit Exam Lab Practical: Microscope Skill Assessment Self Assessment 	<p>Structure and Function of Cells: 2.1, 2.2, 2.5, 2.10 Quantitative and Measurement Skills</p>

<p>UNIT 4: Cellular Energetics</p>	<p>10 days</p>	<ul style="list-style-type: none"> • Oxidation-reduction, thermodynamics and free energy • ATP and energy transfer • Coupled reactions and chemiosmosis • Review basic glycolysis, fermentation, and aerobic respiration; introduce advanced energetics material • Photosynthesis, photosystems I and II, Calvin cycle and carbon fixation • C₃ and C₄ photosynthesis • Evolution of metabolism 	<p>Students will:</p> <ul style="list-style-type: none"> • Model and analyze complex chemical processes. • Understand component relationships in complex systems. • Construct a molecular and cellular evolutionary time line. • Interpret charts and diagrams. • Relate structure to function. • Design experiments. • Extract information from written sources. • Interpret diagrams. • Construct and interpret graphs. • Make essay outlines. • Practice lab safety. 	<ul style="list-style-type: none"> • AP Lab #5: Cell Respiration • Cell Respiration and Photosynthesis Manipulative Models Activities Assessment • AP Bio Lab #4: Plant Pigments and Photosynthesis • Lab: Designing a Controlled Experiment • Evolution of Metabolism chart • Essay outlines • Unit Portfolio Assessment • Unit Exam 	<p>Structure and Function of Cells: 2.3, 2.4, 2.9 Scientific Inquiry Skills</p>
<p>UNIT 5: Cell Reproduction and Molecular Genetics & UNIT 6: Meiosis, Genetics, and Gene Technology</p>	<p>22 days</p>	<ul style="list-style-type: none"> • Prokaryotic and eukaryotic cell reproduction • Review basic DNA structure and replication, experimental evidence; present advanced material • Eukaryotic chromosomal structure, nucleosome, transposable elements • RNA: transcription, mRNA editing, translation • DNA and RNA viruses • Regulation of gene expression • Meiosis, sexual reproduction, gene recombination • Mendel's Laws, probability, genetic crosses • Inheritance patterns: chromosomes, genes, alleles, interactions • Chi square • Mutations • Recombinant DNA, DNA cloning, hybridization, DNA sequencing • Genetic engineering applications 	<p>Students will:</p> <ul style="list-style-type: none"> • Use the microscope • Model and analyze complex molecular processes. • Understand component relationships in complex systems. • Relate structure to function. • Extract information from written sources. • Interpret diagrams. • Make essay outlines. • Practice lab safety. • Use Punnett squares and probability to solve genetics problems. • Construct and analyze pedigrees. • Perform statistical analysis of data using Chi Square. 	<ul style="list-style-type: none"> • Lab Practical: DNA Structure, Replication, and Protein Synthesis • AP Bio Lab #3: (Meiosis) • Crossing Over in Sordaria Lab • AP Bio Lab #6: Molecular Genetics • AP Bio Lab #7: Genetics of Drosophila • Genetic typing with gel electrophoresis • Take-home essay • Essay outlines • Unit Portfolio Assessment • Unit Exam • Self Assessment 	<p>Structure and Function of Cells: 2.5, 2.6, 2.7, 2.8 Genetics: 3.1, 3.2, 3.3, 3.4, 3.5, 3.6</p>

<p>UNIT 7: Evolution</p>	<p>5 days</p>	<ul style="list-style-type: none"> • Review natural selection and evidence for evolution • Origin of life theories • Overview of life on Earth • Population genetics: Hardy-Weinberg principle, factors influencing allelic frequencies • Speciation: isolating mechanisms, allopatry, sympatry, adaptive radiation • Patterns of evolution, gradualism, punctuated equilibrium 	<p>Students will:</p> <ul style="list-style-type: none"> • Perform data analysis. • Draw inferences from data. • Extract information from written sources. • Interpret diagrams. • Construct and interpret graphs. • Make essay outlines. • Practice lab safety. 	<ul style="list-style-type: none"> • AP Bio Lab #8: Population Genetics and Evolution • Amino Acid Sequencing Activity • Molecular Clock Activity • Unit Portfolio Assessment • Unit Exam • Midterm Exam 	<p>Evolution and Biodiversity: 5.1, 5.2, 5.3 Cell Biology 2.2</p>
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<p>UNIT 8: Animal Anatomy and Physiology</p>	<p>10 days</p>	<ul style="list-style-type: none"> • Homeostasis • Organization of the vertebrate body • Tissues and evolution of body types • Structure and function of tissues, organs and systems used for locomotion • Animal adaptations for locomotion • Review structure and function of tissues, organs and systems used for circulation, respiration and digestion • Comparative animal adaptations for circulation, respiration, and digestion • The immune system 	<p>Students will:</p> <ul style="list-style-type: none"> • Use the microscope correctly. • Model and analyze complex molecular processes. • Understand component relationships in complex systems. • Relate structure to function. • Extract information from written sources. • Interpret diagrams. • Construct and interpret graphs. • Make essay outlines. • Practice lab safety. 	<ul style="list-style-type: none"> • Vertebrate Animal Tissues Lab • The Human Skeletal Lab • Muscles and Muscle Contraction Lab • Phylum Chart Comparisons for life functions • Essay outlines • Unit Portfolio Assessment • Unit Exam • AP Bio Lab #10: Physiology of the Circulatory System • Review of Human breathing rate and blood pressure labs • Animal dissection lab • Leukocyte Identification Lab • Interpreting a Circulation Graph • Unit Exam 	<p>Human Anatomy and Physiology: 4.1, 4.2</p>
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UNIT 9: Homeostasis	10 days	<ul style="list-style-type: none"> • Structure and function of tissues and organs of the nervous, sensory, endocrine and excretory systems • Animal adaptations in the nervous, sensory, endocrine and excretory systems • Excretion and osmoregulation • Muscles and muscle contraction • Maintaining homeostasis 	<p>Students will:</p> <ul style="list-style-type: none"> • Use the microscope. • Model and analyze complex molecular processes. • Understand component relationships in complex systems. • Relate structure to function. • Extract information from written sources. • Interpret diagrams. • Make essay outlines. • Practice lab safety. 	<ul style="list-style-type: none"> • Reflex and Senses Lab • Brain Function Activity • Phylum Chart Comparisons • Essay outlines • Take-home essay • Unit Portfolio Assessment • Unit Exam 	Human Anatomy and Physiology: 4.1, 4.2
UNIT 10: Reproduction, Development	5 days	<ul style="list-style-type: none"> • Structure and function of tissues, organs needed for reproduction • Animal adaptations for reproduction • Gametogenesis, fertilization, embryology, development • Biological cycles • Cellular mechanisms of development 	<p>Students will:</p> <ul style="list-style-type: none"> • Research independently • Use the microscope correctly. • Model and analyze complex molecular/cellular processes. • Understand component relationships in complex systems. • Relate structure to function. • Extract information from written sources. • Interpret diagrams. • Construct and interpret graphs. • Make essay outlines. • Practice lab safety. 	<ul style="list-style-type: none"> • Gametogenesis Lab • Comparative Embryology Lab • Phylum Chart Comparisons • Essay outlines • Unit Portfolio Assessment • Unit Exam • Self assessment 	Structure and Function of Cells: 2.10 Genetics: 3.7 Human Anatomy and Physiology: 4.1, 4.2
UNIT 11: Plant Structure and Function	12 days	<ul style="list-style-type: none"> • Plant diversity: classification, divisions, adaptations to land, alternation of generations in moss, fern, pine, and flowering plants • Structure and physiology of vascular plants • Seed formation, germination, growth in seed plants • Hormonal regulation of plant growth • Plant response to stimuli: tropisms, photo-periodicity 	<p>Students will:</p> <ul style="list-style-type: none"> • Understand classification. • Use a dichotomous key to identify organisms. • Use the microscope correctly. • Model and analyze complex molecular processes. • Understand component relationships in complex systems. • Relate structure to function. • Extract information from written sources. • Interpret diagrams. • Construct and interpret graphs. • Make essay outlines. • Practice lab safety. 	<ul style="list-style-type: none"> • Survey of Plants Lab • Plant Anatomy Lab • AP Bio Lab #9: Transpiration • Flower, Fruit and Seed Lab • Essay outlines • Unit Portfolio Assessment • Unit Exam • Final Exam 	Structure and Function of Cells: 2.1, 2.3, 2.6, 2.7, 2.9, 2.10 Evolution and Biodiversity: 4.3 Ecology: 6.5

Student Independent Research	Ongoing	<ul style="list-style-type: none">• Student directed independent research projects and presentations	Students will: <ul style="list-style-type: none">• Extract information from written/internet sources.• Collect, interpret and assess information from multiple sources.• Prepare and present a 20-minute oral research report.	<ul style="list-style-type: none">• Research project Presentation	
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