

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

<b>UNIT</b>	<b>LENGTH</b>	<b>CONTENT</b>	<b>SKILLS</b>	<b>METHODS OF ASSESSMENT</b>	<b>FRAMEWORK STRAND(S) &amp; STANDARD(S)</b>
SUMMER UNIT: Taxonomic Classification	Over the Summer + 3 days	<ul style="list-style-type: none"> <li>• Animal diversity: classification, phylogeny, survey of acoelomate, pseudocoelomate, protosome and deuterostome phyla</li> <li>• Virus structure and function</li> <li>• Ways to classify organisms</li> <li>• The domain system</li> <li>• Phylogenetic trees</li> </ul>	<p>Students will:</p> <ul style="list-style-type: none"> <li>• Understand the approaches of pheneticists and cladists to classification.</li> <li>• Use a dichotomous key to identify organisms.</li> <li>• Construct dichotomous keys.</li> <li>• Construct a phylum chart.</li> <li>• Draw inferences.</li> <li>• Construct an evolutionary cladogram.</li> <li>• Extract information from written sources.</li> <li>• Interpret diagrams.</li> </ul>	<ul style="list-style-type: none"> <li>• Genetic Drift Lab</li> <li>• Survey of Kingdoms Monera, Protista, Fungi, and Animalia Lab</li> <li>• Shark Key</li> <li>• Construction of dichotomous key</li> <li>• Buncus Key</li> <li>• Summer Work Portfolio Assessment</li> <li>• Unit Exam</li> </ul>	Evolution and Biodiversity: 5.1, 5.2, 5.3
UNIT 1: Ecology and Animal Behavior	7 days	<ul style="list-style-type: none"> <li>• Population dynamics, biotic potential, limiting factors</li> <li>• Interactions between species</li> <li>• Ecosystems, energy flow, productivity</li> <li>• Biological communities, succession, biomes</li> <li>• Biogeochemical cycles, future of the biosphere</li> <li>• Animal behavior</li> </ul>	<p>Students will:</p> <ul style="list-style-type: none"> <li>• Complete independent summer reading.</li> <li>• Extract information from written sources.</li> <li>• Construct and interpret graphs.</li> <li>• Demonstrate understanding of mathematical modeling.</li> <li>• Make essay outlines.</li> <li>• Utilize lab report format</li> <li>• Make and record observations in research journal.</li> <li>• Practice lab safety.</li> </ul>	<ul style="list-style-type: none"> <li>• AP Bio Lab #12: Dissolved Oxygen and Aquatic Primary Productivity</li> <li>• AP Bio Lab #11: Behavior: Habitat Selection</li> <li>• Writing assessment</li> <li>• Essay Outlines</li> <li>• Unit exam</li> </ul>	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"> <li>• Review biological chemistry, atoms, molecules, bonding, pH, carbon chemistry, functional groups</li> <li>• Review hydrogen bonding and significance of water</li> <li>• Review carbohydrates, lipids, proteins, nucleic acids</li> <li>• Review dehydration synthesis, hydrolysis</li> <li>• Free-energy changes, equilibrium</li> <li>• Enzymes, coenzymes, cofactors, activity rates, regulation</li> <li>• Evolution of biologically significant molecules</li> </ul>	<p>Students will:</p> <ul style="list-style-type: none"> <li>• Apply scientific method to problem solving.</li> <li>• Construct models.</li> <li>• Recognize science as an ongoing process with continual revision based on interpretation of observations and experimental data.</li> <li>• Relate structure to function.</li> <li>• Extract information from written sources.</li> <li>• Design an experiment.</li> <li>• Construct and interpret graphs.</li> <li>• Make essay outlines.</li> <li>• Practice lab safety.</li> </ul>	<ul style="list-style-type: none"> <li>• Review Chemical testing of biologically significant molecules</li> <li>• AP Lab #2: Enzyme Catalysis</li> <li>• Chemistry of Protein Structure - Gel Electrophoresis Activity</li> <li>• Take-home Quiz</li> <li>• Essay outlines</li> <li>• Unit Portfolio Assessment</li> <li>• Unit Exam</li> </ul>	<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"> <li>• Review prokaryotic and eukaryotic cells</li> <li>• Differentiate plant, animal and fungal cells</li> <li>• Review structure and function of organelles</li> <li>• Subcellular components of motility, cytoskeleton</li> <li>• Diffusion and osmosis</li> <li>• Osmotic balance and water potential</li> <li>• Cell membrane structure and function</li> <li>• Passive and active transport mechanisms</li> <li>• Cell communication; connections between cells</li> <li>• Mitosis and the cell cycle; cytokinesis</li> <li>• Review identification of stages of mitosis</li> <li>• Surface area to volume ratio</li> </ul>	<p>Students will:</p> <ul style="list-style-type: none"> <li>• Use and care for microscopes correctly.</li> <li>• Estimate size of microscopic specimens.</li> <li>• Demonstrate understanding of slide preparation techniques.</li> <li>• Perform unit conversion.</li> <li>• Make detailed observations.</li> <li>• Make detailed lab drawings.</li> <li>• Develop models and recognize their limitations.</li> <li>• Relate structure to function.</li> <li>• Extract information from written sources.</li> <li>• Interpret diagrams.</li> <li>• Make essay outlines.</li> <li>• Practice lab safety.</li> </ul>	<ul style="list-style-type: none"> <li>• Review basic microscope skills</li> <li>• AP Lab #1: Diffusion and Osmosis</li> <li>• Survey of Kingdoms Monera and Protista lab</li> <li>• Plasmolysis Lab</li> <li>• Take-home Quiz</li> <li>• Ap Bio Lab #3: Mitosis</li> <li>• Essay outlines</li> <li>• Unit Portfolio Assessment</li> <li>• Unit Exam</li> <li>• Lab Practical: Microscope Skill Assessment</li> <li>• Self Assessment</li> </ul>	<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"> <li>• Oxidation-reduction, thermodynamics and free energy</li> <li>• ATP and energy transfer</li> <li>• Coupled reactions and chemiosmosis</li> <li>• Review basic glycolysis, fermentation, and aerobic respiration; introduce advanced energetics material</li> <li>• Photosynthesis, photosystems I and II, Calvin cycle and carbon fixation</li> <li>• C<sub>3</sub> and C<sub>4</sub> photosynthesis</li> <li>• Evolution of metabolism</li> </ul>	<p>Students will:</p> <ul style="list-style-type: none"> <li>• Model and analyze complex chemical processes.</li> <li>• Understand component relationships in complex systems.</li> <li>• Construct a molecular and cellular evolutionary time line.</li> <li>• Interpret charts and diagrams.</li> <li>• Relate structure to function.</li> <li>• Design experiments.</li> <li>• Extract information from written sources.</li> <li>• Interpret diagrams.</li> <li>• Construct and interpret graphs.</li> <li>• Make essay outlines.</li> <li>• Practice lab safety.</li> </ul>	<ul style="list-style-type: none"> <li>• AP Lab #5: Cell Respiration</li> <li>• Cell Respiration and Photosynthesis Manipulative Models Activities Assessment</li> <li>• AP Bio Lab #4: Plant Pigments and Photosynthesis</li> <li>• Lab: Designing a Controlled Experiment</li> <li>• Evolution of Metabolism chart</li> <li>• Essay outlines</li> <li>• Unit Portfolio Assessment</li> <li>• Unit Exam</li> </ul>	<p>Structure and Function of Cells: 2.3, 2.4, 2.9 Scientific Inquiry Skills</p>
<p>UNIT 5: Cell Reproduction and Molecular Genetics &amp; UNIT 6: Meiosis, Genetics, and Gene Technology</p>	<p>22 days</p>	<ul style="list-style-type: none"> <li>• Prokaryotic and eukaryotic cell reproduction</li> <li>• Review basic DNA structure and replication, experimental evidence; present advanced material</li> <li>• Eukaryotic chromosomal structure, nucleosome, transposable elements</li> <li>• RNA: transcription, mRNA editing, translation</li> <li>• DNA and RNA viruses</li> <li>• Regulation of gene expression</li> <li>• Meiosis, sexual reproduction, gene recombination</li> <li>• Mendel's Laws, probability, genetic crosses</li> <li>• Inheritance patterns: chromosomes, genes, alleles, interactions</li> <li>• Chi square</li> <li>• Mutations</li> <li>• Recombinant DNA, DNA cloning, hybridization, DNA sequencing</li> <li>• Genetic engineering applications</li> </ul>	<p>Students will:</p> <ul style="list-style-type: none"> <li>• Use the microscope</li> <li>• Model and analyze complex molecular processes.</li> <li>• Understand component relationships in complex systems.</li> <li>• Relate structure to function.</li> <li>• Extract information from written sources.</li> <li>• Interpret diagrams.</li> <li>• Make essay outlines.</li> <li>• Practice lab safety.</li> <li>• Use Punnett squares and probability to solve genetics problems.</li> <li>• Construct and analyze pedigrees.</li> <li>• Perform statistical analysis of data using Chi Square.</li> </ul>	<ul style="list-style-type: none"> <li>• Lab Practical: DNA Structure, Replication, and Protein Synthesis</li> <li>• AP Bio Lab #3: (Meiosis)</li> <li>• Crossing Over in Sordaria Lab</li> <li>• AP Bio Lab #6: Molecular Genetics</li> <li>• AP Bio Lab #7: Genetics of Drosophila</li> <li>• Genetic typing with gel electrophoresis</li> <li>• Take-home essay</li> <li>• Essay outlines</li> <li>• Unit Portfolio Assessment</li> <li>• Unit Exam</li> <li>• Self Assessment</li> </ul>	<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"> <li>• Review natural selection and evidence for evolution</li> <li>• Origin of life theories</li> <li>• Overview of life on Earth</li> <li>• Population genetics: Hardy-Weinberg principle, factors influencing allelic frequencies</li> <li>• Speciation: isolating mechanisms, allopatry, sympatry, adaptive radiation</li> <li>• Patterns of evolution, gradualism, punctuated equilibrium</li> </ul>	<p>Students will:</p> <ul style="list-style-type: none"> <li>• Perform data analysis.</li> <li>• Draw inferences from data.</li> <li>• Extract information from written sources.</li> <li>• Interpret diagrams.</li> <li>• Construct and interpret graphs.</li> <li>• Make essay outlines.</li> <li>• Practice lab safety.</li> </ul>	<ul style="list-style-type: none"> <li>• AP Bio Lab #8: Population Genetics and Evolution</li> <li>• Amino Acid Sequencing Activity</li> <li>• Molecular Clock Activity</li> <li>• Unit Portfolio Assessment</li> <li>• Unit Exam</li> <li>• Midterm Exam</li> </ul>	<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"> <li>• Homeostasis</li> <li>• Organization of the vertebrate body</li> <li>• Tissues and evolution of body types</li> <li>• Structure and function of tissues, organs and systems used for locomotion</li> <li>• Animal adaptations for locomotion</li> <li>• Review structure and function of tissues, organs and systems used for circulation, respiration and digestion</li> <li>• Comparative animal adaptations for circulation, respiration, and digestion</li> <li>• The immune system</li> </ul>	<p>Students will:</p> <ul style="list-style-type: none"> <li>• Use the microscope correctly.</li> <li>• Model and analyze complex molecular processes.</li> <li>• Understand component relationships in complex systems.</li> <li>• Relate structure to function.</li> <li>• Extract information from written sources.</li> <li>• Interpret diagrams.</li> <li>• Construct and interpret graphs.</li> <li>• Make essay outlines.</li> <li>• Practice lab safety.</li> </ul>	<ul style="list-style-type: none"> <li>• Vertebrate Animal Tissues Lab</li> <li>• The Human Skeletal Lab</li> <li>• Muscles and Muscle Contraction Lab</li> <li>• Phylum Chart Comparisons for life functions</li> <li>• Essay outlines</li> <li>• Unit Portfolio Assessment</li> <li>• Unit Exam</li> <li>• AP Bio Lab #10: Physiology of the Circulatory System</li> <li>• Review of Human breathing rate and blood pressure labs</li> <li>• Animal dissection lab</li> <li>• Leukocyte Identification Lab</li> <li>• Interpreting a Circulation Graph</li> <li>• Unit Exam</li> </ul>	<p>Human Anatomy and Physiology: 4.1, 4.2</p>
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<p>UNIT 9: Homeostasis</p>	<p>10 days</p>	<ul style="list-style-type: none"> <li>• Structure and function of tissues and organs of the nervous, sensory, endocrine and excretory systems</li> <li>• Animal adaptations in the nervous, sensory, endocrine and excretory systems</li> <li>• Excretion and osmoregulation</li> <li>• Muscles and muscle contraction</li> <li>• Maintaining homeostasis</li> </ul>	<p>Students will:</p> <ul style="list-style-type: none"> <li>• Use the microscope.</li> <li>• Model and analyze complex molecular processes.</li> <li>• Understand component relationships in complex systems.</li> <li>• Relate structure to function.</li> <li>• Extract information from written sources.</li> <li>• Interpret diagrams.</li> <li>• Make essay outlines.</li> <li>• Practice lab safety.</li> </ul>	<ul style="list-style-type: none"> <li>• Reflex and Senses Lab</li> <li>• Brain Function Activity</li> <li>• Phylum Chart Comparisons</li> <li>• Essay outlines</li> <li>• Take-home essay</li> <li>• Unit Portfolio Assessment</li> <li>• Unit Exam</li> </ul>	<p>Human Anatomy and Physiology: 4.1, 4.2</p>
<p>UNIT 10: Reproduction, Development</p>	<p>5 days</p>	<ul style="list-style-type: none"> <li>• Structure and function of tissues, organs needed for reproduction</li> <li>• Animal adaptations for reproduction</li> <li>• Gametogenesis, fertilization, embryology, development</li> <li>• Biological cycles</li> <li>• Cellular mechanisms of development</li> </ul>	<p>Students will:</p> <ul style="list-style-type: none"> <li>• Research independently</li> <li>• Use the microscope correctly.</li> <li>• Model and analyze complex molecular/cellular processes.</li> <li>• Understand component relationships in complex systems.</li> <li>• Relate structure to function.</li> <li>• Extract information from written sources.</li> <li>• Interpret diagrams.</li> <li>• Construct and interpret graphs.</li> <li>• Make essay outlines.</li> <li>• Practice lab safety.</li> </ul>	<ul style="list-style-type: none"> <li>• Gametogenesis Lab</li> <li>• Comparative Embryology Lab</li> <li>• Phylum Chart Comparisons</li> <li>• Essay outlines</li> <li>• Unit Portfolio Assessment</li> <li>• Unit Exam</li> <li>• Self assessment</li> </ul>	<p>Structure and Function of Cells: 2.10 Genetics: 3.7 Human Anatomy and Physiology: 4.1, 4.2</p>
<p>UNIT 11: Plant Structure and Function</p>	<p>12 days</p>	<ul style="list-style-type: none"> <li>• Plant diversity: classification, divisions, adaptations to land, alternation of generations in moss, fern, pine, and flowering plants</li> <li>• Structure and physiology of vascular plants</li> <li>• Seed formation, germination, growth in seed plants</li> <li>• Hormonal regulation of plant growth</li> <li>• Plant response to stimuli: tropisms, photo-periodicity</li> </ul>	<p>Students will:</p> <ul style="list-style-type: none"> <li>• Understand classification.</li> <li>• Use a dichotomous key to identify organisms.</li> <li>• Use the microscope correctly.</li> <li>• Model and analyze complex molecular processes.</li> <li>• Understand component relationships in complex systems.</li> <li>• Relate structure to function.</li> <li>• Extract information from written sources.</li> <li>• Interpret diagrams.</li> <li>• Construct and interpret graphs.</li> <li>• Make essay outlines.</li> <li>• Practice lab safety.</li> </ul>	<ul style="list-style-type: none"> <li>• Survey of Plants Lab</li> <li>• Plant Anatomy Lab</li> <li>• AP Bio Lab #9: Transpiration</li> <li>• Flower, Fruit and Seed Lab</li> <li>• Essay outlines</li> <li>• Unit Portfolio Assessment</li> <li>• Unit Exam</li> <li>• Final Exam</li> </ul>	<p>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</p>

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