



## **Advanced Placement Biology**

The *CareerTech* AP Biology course is designed to serve as an equivalent course to a general biology course taken in the first year of college. Class size, cost, and more personalized instruction are just a few advantages of taking this course during the high school years. Completion of this course will enable the student to be successful and advanced in a college biology course or other courses in which general college biology is a prerequisite. Students will attain a depth of understanding of biology fundamentals and an aptitude in laboratory techniques and procedures. The ODCTE AP Biology Standard was correlated with Oklahoma Biology PASS (Priority Academic Student Skills) Content and Process Standards as well as NSES (National Science Education Standards). This document provides an outline for administrators, teachers, parents, and students. At the end of this course students will be able to score at a level on the AP exam that will earn credit and/or waive requirements at most higher level institutions in the country. Institutions that offer College Board® courses are required to submit annual audits through that organization.

### **Course Description**

AP Biology is a fast paced course that emphasizes molecules and cells, heredity and evolution, as well as organisms and populations. As a college level course, advanced lab techniques will be taught and current bioethical issues will be discussed. Students will learn through laboratory and lecture methods using group and individual activities, cooperative learning, presentations, and technology to enhance the learning environment. Students will be challenged to develop a conceptual framework and an appreciation of science as a process. Prerequisites: Biology I, Chemistry-highly recommended.

Developed by the  
Innovative Initiatives Division  
For the  
Oklahoma Department of Career and Technology Education  
Copyright 2008



**Requirements for College Admission Status (Title 70 O.S. § 11-103.6)**

These courses are to be taught by a highly qualified teacher with an Oklahoma Biology teaching certification. The students should be in the eleventh or twelfth grade or if a sophomore, they should be in a Focused Field of Career Study program. The prerequisite for this course is Biology I with Chemistry being highly recommended. The course should consist of 40% laboratory or fieldwork in order to be considered a lab science. The course will have at a minimum, but may exceed, a duration of 120 hours within a school year (72 hours theory/48 lab hours).



## AP Biology

<b>Objectives</b>	<b>National Science Education Standards 9-12 Content Standards</b>	<b>Oklahoma Biology Content and Process PASS Standards</b>
<b>Molecules and Cells</b>		
<b>Chemistry of Life</b>		
<ul style="list-style-type: none"> <li>Describe the fundamental unit of matter, the atom</li> </ul>	B, C	
<ul style="list-style-type: none"> <li>Describe the functions of protons, electrons, and neutrons</li> </ul>	B	
<ul style="list-style-type: none"> <li>Define elements and isotopes</li> </ul>	B	
<ul style="list-style-type: none"> <li>Describe covalent and ionic bonding</li> </ul>	B	
<ul style="list-style-type: none"> <li>Analyze the chemical and physical properties of water</li> </ul>	B	<b>Content</b> 5.2
<ul style="list-style-type: none"> <li>Examine the structure and function of organic molecules</li> </ul>	B	<b>Content</b> 5.1, 5.2
<ul style="list-style-type: none"> <li>Analyze free energy changes</li> </ul>	C	<b>Content</b> 5.1, 5.2
<ul style="list-style-type: none"> <li>Describe the structure and function of enzymes</li> </ul>	C	<b>Content</b> 5.1, 5.2, 6.1
<b>Cells</b>		
<ul style="list-style-type: none"> <li>Describe the fundamental unit of life, the cell</li> </ul>	C	<b>Content</b> 1.1, 1.2, 2.1
<ul style="list-style-type: none"> <li>Compare and contrast prokaryotic and eukaryotic cells</li> </ul>	C	<b>Content</b> 1.1, 1.2, 3.1, 5.1
<ul style="list-style-type: none"> <li>Describe the components of eukaryotic cells</li> </ul>	C	<b>Content</b> 1.1, 1.2, 2.1

<ul style="list-style-type: none"> <li>• Compare and contrast plant and animal cells</li> </ul>	C	<b>Content</b> 1.1, 1.2, 2.1, 3.1, 5.1, 6.1, 6.2
<ul style="list-style-type: none"> <li>• Analyze cellular membranes and describe the functions</li> </ul>	C	<b>Content</b> 1.1, 1.2
<ul style="list-style-type: none"> <li>• Examine sub cellular organization</li> </ul>	C	<b>Content</b> 1.1, 1.2
<ul style="list-style-type: none"> <li>• Analyze the cell cycle and its regulation</li> </ul>	C	<b>Content</b> 1.1, 1.2, 2.1, 5.1
<b>Cellular Energetics</b>		
<ul style="list-style-type: none"> <li>• Describe the two fundamental principles of energy</li> </ul>	B, C	<b>Content</b> 5.2
<ul style="list-style-type: none"> <li>• Explain how energy is used by living things</li> </ul>	B, C	<b>Content</b> 5.1, 5.2
<ul style="list-style-type: none"> <li>• Explain how adenosine triphosphate (ATP) is used</li> </ul>	B, C	<b>Content</b> 1.1, 2.1, 5.1
<ul style="list-style-type: none"> <li>• Describe coupled reactions</li> </ul>	B	<b>Content</b> 5.1
<ul style="list-style-type: none"> <li>• Explain the process of fermentation</li> </ul>	B	<b>Content</b> 1.1, 5.1
<ul style="list-style-type: none"> <li>• Explain the three stages of cellular respiration <ul style="list-style-type: none"> <li>○ Glycolsis, the Kreb's cycle, and the electron transport chain</li> </ul> </li> </ul>	B	<b>Content</b> 1.1, 5.1
<ul style="list-style-type: none"> <li>• Explain the process of photosynthesis <ul style="list-style-type: none"> <li>○ Location</li> <li>○ Light reaction stage</li> <li>○ Calvin Cycle</li> <li>○ CAM plant variations</li> </ul> </li> </ul>	B, C	<b>Content</b> 1.1, 1.2, 5.1, 5.2, 6.1
<b>Heredity and Evolution</b>		
<b>Heredity</b>		
<ul style="list-style-type: none"> <li>• Describe the stages of mitosis</li> </ul>	B, C	<b>Content</b> 2.1, 2.2
<ul style="list-style-type: none"> <li>• Analyze meiosis and gametogenesis</li> </ul>	A, B, C	<b>Content</b> 1.1, 1.2, 2.1, 2.2, 3.1, 3.2

<ul style="list-style-type: none"> <li>Describe the importance of meiosis</li> </ul>	B, C	<b>Content</b> 2.2, 5.1
<ul style="list-style-type: none"> <li>Assess the organization of Eukaryotic chromosomes</li> </ul>	B, C	<b>Content</b> 1.1, 1.2, 2.1, 3.1, 3.2
<ul style="list-style-type: none"> <li>Demonstrate an understanding of inheritance patterns</li> </ul>	A, B, C	<b>Content</b> 2.1, 2.2, 3.1, 3.2, 6.1
<b>Molecular Genetics</b>		
<ul style="list-style-type: none"> <li>Compare and contrast the structure and function of RNA and DNA</li> </ul>	B, C	<b>Content</b> 1.1, 2.1, 2.2
<ul style="list-style-type: none"> <li>Assess gene regulation and how it occurs</li> </ul>	B, C	<b>Content</b> 2.1, 2.2
<ul style="list-style-type: none"> <li>Analyze mutations, ways they occur, and the possibility of genetic variation</li> </ul>	A, B, C, F	<b>Content</b> 2.1, 2.2, 3.1, 3.2
<ul style="list-style-type: none"> <li>Investigate viral structure and replication</li> </ul>	A, B, C, F	<b>Content</b> 1.1, 2.1, 2.2, 4.2
<ul style="list-style-type: none"> <li>Examine nucleic acid technology and its applications</li> </ul>	B, C	<b>Content</b> 1.1, 2.1, 2.2
<b>Evolutionary Biology</b>		
<ul style="list-style-type: none"> <li>Analyze current theories on early evolution of life</li> </ul>	A, C	<b>Content</b> 3.1, 3.2, 4.2, 4.3, 5.2, 6.2
<ul style="list-style-type: none"> <li>Examine the evidence for evolution</li> </ul>	C,	<b>Content</b> 3.1, 3.2, 4.2, 4.3, 5.2, 6.2
<ul style="list-style-type: none"> <li>Analyze the mechanisms of evolution</li> </ul>	A, C	<b>Content</b> 3.1, 3.2, 4.2, 4.3, 5.2, 6.2
<ul style="list-style-type: none"> <li>Explain microevolution and macroevolution</li> </ul>	C	<b>Content</b> 3.1, 3.2, 4.2, 4.3, 5.2, 6.2
<ul style="list-style-type: none"> <li>Explain the categorization of earth's living things</li> </ul>	F	<b>Content</b> 3.1, 3.2, 4.2, 4.3, 5.2, 6.2
<b>Organisms and Populations</b>		
<b>Diversity of Organisms</b>		
<ul style="list-style-type: none"> <li>Examine evolutionary patterns</li> </ul>	C	<b>Content</b> 3.1, 3.2, 4.2, 4.3, 5.2, 6.2

<ul style="list-style-type: none"> <li>Survey of the diversity of life</li> </ul>	F	<b>Content</b> 3.1, 3.2, 4.2, 4.3, 5.2, 6.2
<ul style="list-style-type: none"> <li>Identify the domains of life</li> </ul>	F	<b>Content</b> 3.2
<ul style="list-style-type: none"> <li>Explain the role and categories of fungi</li> </ul>	C	<b>Content</b> 1.2, 3.1
<ul style="list-style-type: none"> <li>Examine and apply phylogenetic classification</li> </ul>	A	<b>Content</b> 3.1,3.2
<ul style="list-style-type: none"> <li>Compare and contrast protostome and deuterostome animal lines</li> </ul>	A, C	<b>Content</b> 3.1, 3.2, 6.2
<ul style="list-style-type: none"> <li>Examine evolutionary relationships</li> </ul>	C	<b>Content</b> 3.1, 3.2, 6.2
<b>Structure and Function of Plants and Animals</b>		
<ul style="list-style-type: none"> <li>Explain the importance of plants</li> </ul>	B, C	<b>Content</b> 3.2, 4.1, 4.2, 4.3, 5.1, 5.2
<ul style="list-style-type: none"> <li>Describe the structure of plants</li> </ul>	B	<b>Content</b> 1.1, 1.2, 2.1, 2.2, 3.1, 3.2, 4.1,5.1
<ul style="list-style-type: none"> <li>Analyze the basic functions in flowering plants</li> </ul>	A, C	<b>Content</b> 1.1, 1.2, 2.1, 2.2, 3.1, 3.2, 4.1, 6.2
<ul style="list-style-type: none"> <li>Analyze how plants respond to external signals</li> </ul>	A, C	<b>Content</b> 1.1, 1.2, 2.1, 2.2, 3.1, 3.2, 4.1, 6.2
<ul style="list-style-type: none"> <li>Compare and contrast the two ways to categorize flowering plants</li> </ul>	A, B	<b>Content</b> 1.1, 1.2, 2.1, 2.2, 3.1, 3.2, 4.1, 6.2
<ul style="list-style-type: none"> <li>Analyze reproduction, growth, and development of plants</li> </ul>	A, C	<b>Content</b> 1.1, 1.2, 2.1, 2.2, 3.1, 3.2, 4.1, 6.2

<ul style="list-style-type: none"> <li>Analyze the structure of humans, including tissues, organs, skin, skeletal system, and muscular system</li> </ul>	A	<b>Content</b> 1.1, 1.2, 2.1, 2.2, 3.1, 3.2, 5.1
<ul style="list-style-type: none"> <li>Examine the structure and function of the human nervous system</li> </ul>	A	<b>Content</b> 1.1, 2.1, 5.1
<ul style="list-style-type: none"> <li>Analyze the human immune system, cardiovascular system, respiratory system, and digestive system</li> </ul>	A	<b>Content</b> 1.1, 2.1, 5.1
<ul style="list-style-type: none"> <li>Analyze the reproduction, growth and development process of animal</li> </ul>	A	<b>Content</b> 1.1, 2.1, 5.1, 6.2
<ul style="list-style-type: none"> <li>Examine structural, physiological, and behavioral adaptations</li> </ul>	A	<b>Content</b> 1.1, 2.1, 5.1, 6.1, 6.2
<ul style="list-style-type: none"> <li>Identify response to the environment</li> </ul>	A, F	<b>Content</b> 3.1, 3.2, 3.3, 4.1, 4.2, 4.3, 6.1, 6.2
<b>Ecology</b>		
<ul style="list-style-type: none"> <li>Examine population dynamics</li> </ul>	A, F	<b>Content</b> 4.1, 4.2, 4.3, 5.2, 6.2
<ul style="list-style-type: none"> <li>Examine structures of communities</li> </ul>	A, F	<b>Content</b> 4.1, 4.2, 4.3, 5.2, 6.2
<ul style="list-style-type: none"> <li>Examine the four primary types of interaction among community members</li> </ul>	A, F	<b>Content</b> 4.1, 4.2, 4.3, 5.2, 6.2
<ul style="list-style-type: none"> <li>Analyze succession in communities</li> </ul>	A, F	<b>Content</b> 4.1, 4.2, 4.3, 5.2, 6.2
<ul style="list-style-type: none"> <li>Define ecosystems and aquatic ecosystems and describe their energy flow</li> </ul>	C	<b>Content</b> 4.1, 4.2, 4.3, 5.2, 6.2
<ul style="list-style-type: none"> <li>Analyze the earth's physical environment, global warming and the earth's climate and biomes</li> </ul>	A	<b>Content</b> 4.1, 4.3, 5.2, 6.2
<ul style="list-style-type: none"> <li>Assess global issues</li> </ul>	A	<b>Content</b> 4.1, 4.3, 5.2, 6.2

<p><b>Lab/Activities:</b> These labs follow Collegeboard ® recommendations.</p>		
<p><b>Diffusion and Osmosis</b> Students will:</p> <ul style="list-style-type: none"> <li>• Measure the water potential of a solution in a controlled experiment</li> <li>• Determine the osmotic concentration of living tissue or an unknown solution from experimental data</li> <li>• Describe the effects of water gain or loss in animal and plant cells</li> <li>• Relate osmotic potential to solute concentration and water potential</li> <li>• Write a detailed lab report citing all steps in the scientific method</li> </ul>	A, B, C	<p><b>Process</b> 1.1, 1.2, 1.3, 3.1, 3.2, 3.3, 3.4, 3.5, 4.1, 4.2, 4.3, 4.4, 4.5, 4.6, 4.7, 5.1, 5.2, 5.3, 6.1, 6.2, 6.3, 6.4</p>
<p><b>Enzyme Catalysis</b> Students will:</p> <ul style="list-style-type: none"> <li>• Measure the effects of changes of temperature, pH, enzyme concentration on reaction rates of an enzyme-catalyzed reaction in a controlled experiment</li> <li>• Explain how environmental factors affect the rate of enzyme-catalyzed reactions</li> </ul>	A, B, C	<p><b>Process</b> 1.1, 1.2, 1.3, 3.1, 3.2, 3.3, 3.4, 3.5, 4.1, 4.2, 4.3, 4.4, 4.5, 4.6, 4.7, 5.1, 5.2, 5.3, 6.1, 6.2, 6.3, 6.4</p>

<p><b>Mitosis and Meiosis</b> Students will:</p> <ul style="list-style-type: none"> <li>• Recognize the stages of mitosis in a plant in or animal cell</li> <li>• Calculate the relative duration of the cell cycle stages</li> <li>• Describe how independent assortment and crossing over can generate genetic variation among the products of meiosis</li> <li>• Use chromosome models to demonstrate the activity of chromosomes during meiosis I and meiosis II</li> <li>• Relate chromosome activity to Mendelian segregation and independent assortment</li> <li>• Demonstrate the role of meiosis in the formation of gametes in a controlled experiment, using a model organism</li> <li>• Calculate the map distance of a particular gene from a chromosome's center or between two genes, using a model organism</li> <li>• Compare and contrast the results of meiosis and mitosis in plant cells</li> <li>• Compare and contrast the result of meiosis and mitosis in animal cells</li> <li>• Write a detailed lab report citing all steps in the scientific method</li> </ul>	<p>A, C, E</p>	<p><b>Process</b> 1.1, 1.2, 1.3, 2.1, 2.2, 3.1, 3.2, 3.3, 3.4, 3.5, 4.1, 4.2, 4.3, 4.4, 4.5, 4.6, 4.7, 4.8, 5.1, 5.2, 5.3, 6.1, 6.2, 6.3, 6.4</p>
<p><b>Plant Pigments and Photosynthesis</b> Students will:</p> <ul style="list-style-type: none"> <li>• Separate pigments and calculate their Rf values</li> <li>• Describe a technique to determine photosynthetic rates</li> <li>• Compare photosynthetic rates at different temperatures, or different light intensities, or different wavelengths of light using controlled experiments</li> <li>• Explain why the rate of photosynthesis varies under different environmental conditions</li> <li>• Write a detailed lab report citing all steps in the scientific method</li> </ul>	<p>A, C, E, F</p>	<p><b>Process</b> 1.1, 1.2, 1.3, 3.1, 3.2, 3.3, 3.4, 3.5, 4.1, 4.2, 4.3, 4.4, 4.5, 4.6, 4.7, 5.1, 5.2, 5.3, 6.1, 6.2, 6.3, 6.4</p>

<p><b>Cell Respiration</b> Students will:</p> <ul style="list-style-type: none"> <li>• Calculate the rate of cell respiration from experimental data</li> <li>• Relate gas production to respiration rate</li> <li>• Test the effects of temperature on the rate of cell respiration in ungerminated versus seeds in a controlled experiment</li> <li>• Write a detailed lab report citing all steps in the scientific method</li> </ul>	A, C, F	<p><b>Process</b> 1.1, 1.2, 1.3, 3.1, 3.2, 3.3, 3.4, 3.5, 4.1, 4.2, 4.3, 4.4, 4.5, 4.6, 4.7, 5.1, 5.2, 5.3, 6.1, 6.2, 6.3, 6.4</p>
<p><b>Molecular Biology</b> Students will:</p> <ul style="list-style-type: none"> <li>• Use plasmids as vectors to transform bacteria with a gene for antibiotic resistance in a controlled experiment</li> <li>• Demonstrate how restriction enzymes are used in genetic engineering</li> <li>• Use electrophoresis to separate DNA fragments</li> <li>• Describe the biological process of transformation in bacteria</li> <li>• Calculate transformation efficiency</li> <li>• Be able to use multiple experimental controls</li> <li>• Design a procedure to select positively for antibiotic resistant transformed cells</li> <li>• Determine unknown DNA fragment sizes when given DNA fragments of known size</li> <li>• Write a detailed lab report citing all steps in the scientific method</li> </ul>	A, C, E, F	<p><b>Process</b> 1.1, 1.2, 1.3, 2.1, 2.2, 3.1, 3.2, 3.3, 3.4, 3.5, 4.1, 4.2, 4.3, 4.4, 4.5, 4.6, 4.7, 5.1, 5.2, 5.3, 6.1, 6.2, 6.3, 6.4</p>
<p><b>Genetics of Organisms</b> Students will:</p> <ul style="list-style-type: none"> <li>• Investigate the independent assortment of two genes and determine whether the two genes are autosomal or sex-linked using a multigenerational experiment</li> <li>• Analyze the data from their genetic crosses using chi-square analysis techniques</li> <li>• Write a detailed lab report citing all steps in the scientific method</li> </ul>	A, C, E, F	<p><b>Process</b> 1.1, 1.2, 1.3, 2.1, 2.2, 3.1, 3.2, 3.3, 3.4, 3.5, 4.1, 4.2, 4.3, 4.4, 4.5, 4.6, 4.7, 4.8, 5.1, 5.2, 5.3, 6.1, 6.2, 6.3, 6.4</p>

<p><b>Population Genetics and Evolution</b> Students will:</p> <ul style="list-style-type: none"> <li>• Calculate the frequencies of alleles and genotypes in the gene pool of a population using the Hardy-Weinberg formula</li> <li>• Discuss natural selection and other causes of microevolution as deviation from the conditions required to maintain Hardy-Weinberg equilibrium</li> <li>• Write a detailed lab report citing all steps in the scientific method</li> <li>• Write a detailed lab report citing all steps in the scientific method</li> </ul>	A, C	<p><b>Process</b> 1.1, 1.2, 1.3, 2.1, 2.2, 3.1, 3.2, 3.3, 3.4, 3.5, 4.1, 4.2, 4.3, 4.4, 4.5, 4.6, 4.7, 5.1, 5.2, 5.3, 6.1, 6.2, 6.3, 6.4</p>
<p><b>Transpiration</b> Students will:</p> <ul style="list-style-type: none"> <li>• Test the effects of the environmental variables on the rates of transpiration using a controlled experiment</li> <li>• Make thin sections of stem, identify xylem and phloem cells, and relate the function of these vascular tissues to the structures of their cells</li> <li>• Write a detailed lab report citing all steps in the scientific method</li> </ul>	A, C, E	<p><b>Process</b> 1.1, 1.2, 1.3, 3.1, 3.2, 3.3, 3.4, 3.5, 4.1, 4.2, 4.3, 4.4, 4.5, 4.6, 4.7, 5.1, 5.2, 5.3, 6.1, 6.2, 6.3, 6.4</p>
<p><b>Physiology of the Circulatory System</b> Students will:</p> <ul style="list-style-type: none"> <li>• Measure heart rate and blood pressure in a human volunteer</li> <li>• Describe the effect of changing body position on hear rate and blood pressure</li> <li>• Explain how exercise changes hear rate</li> <li>• Determine a human’s fitness index</li> <li>• Analyze cardiovascular data collected by the entire class</li> <li>• Discuss and explain the relationship between heart rate and temperature</li> <li>• Write a detailed lab report citing all steps in the scientific method</li> </ul>	A, C, E, F	<p><b>Process</b> 1.1, 1.2, 1.3, 3.1, 3.2, 3.3, 3.4, 3.5, 4.1, 4.2, 4.3, 4.4, 4.5, 4.6, 4.7, 4.8, 5.1, 5.2, 5.3, 6.1, 6.2, 6.3, 6.4</p>

<p><b>Animal Behavior</b> Students will:</p> <ul style="list-style-type: none"> <li>• Describe some aspects of animal behavior, such as orientation behavior, agonistic behavior, dominance display, or mating behavior</li> <li>• Understand the adaptiveness of the behaviors they have studied</li> <li>• Write a detailed lab report citing all steps in the scientific method</li> </ul>	A, C, F	<p><b>Process</b> 1.1, 1.2, 1.3, 3.1, 3.2, 3.3, 3.4, 3.5, 4.1, 4.2, 4.3, 4.4, 4.5, 4.6, 4.7, 5.1, 5.2, 5.3, 6.1, 6.2, 6.3, 6.4</p>
<p><b>Dissolved Oxygen and Aquatic Primary Productivity</b> Students will:</p> <ul style="list-style-type: none"> <li>• Measure primary productivity based on changes in dissolved oxygen in a controlled experiment</li> <li>• Investigate the effects of changing light intensity and/or inorganic nutrient concentrations on primary productivity in a controlled experiment</li> <li>• Write a detailed lab report citing all steps in the scientific method</li> </ul>	A, B, C, E, F	<p><b>Process</b> 1.1, 1.2, 1.3, 3.1, 3.2, 3.3, 3.4, 3.5, 4.1, 4.2, 4.3, 4.4, 4.5, 4.6, 4.7, 6.1, 6.2, 6.3, 6.4</p>
<p><b>Organisms</b> Students will:</p> <ul style="list-style-type: none"> <li>• List each of the four possible components required for photosynthesis to occur and the two possible end products</li> <li>• Discuss the connection between starch production and the process of photosynthesis</li> <li>• Diagram and label a food chain</li> <li>• Discuss the pathways of energy transfer through food webs and the efficiency of the transfer</li> <li>• Conclude on what the four key ingredients needed for photosynthesis</li> <li>• Write a detailed lab report citing all steps in the scientific method</li> </ul>	A, B, C,	<p><b>Process</b> 1.1, 1.2, 1.3, 3.1, 3.2, 3.3, 3.4, 3.5, 4.1, 4.2, 4.3, 4.4, 4.5, 4.6, 4.7, 6.1, 6.2, 6.3, 6.4</p>

<p><b>Plant Cells</b> Students will:</p> <ul style="list-style-type: none"> <li>• Observe major cellular organelles microscopically</li> <li>• Chart the organelles and their functions</li> <li>• Observe the similarities and differences between plant and animal cells</li> <li>• Apply the knowledge of the differences to real-life situations</li> <li>• Prepare and observe plant cells microscopically</li> <li>• Prepare plant cell to view stomata</li> <li>• Observe stoma microscopically</li> <li>• Prepare and observe one cell organisms microscopically</li> <li>• Observe one cell organisms phagocytosis microscopically</li> <li>• Write a detailed lab report citing all steps in the scientific method</li> </ul>	<p>A, C, E</p>	<p><b>Process</b> 1.1, 1.2, 1.3, 3.1, 3.2, 3.3, 3.4, 3.5, 4.1, 4.2, 4.3, 4.4, 4.5, 4.6, 4.7, 4.8, 5.1, 5.2, 5.3, 6.1, 6.2, 6.3, 6.4</p>
<p><b>Cellular Respiration</b> Students will:</p> <ul style="list-style-type: none"> <li>• Explain the process of aerobic respiration in plants and animals</li> <li>• Compare the rate of cellular respiration and carbon dioxide production while at rest with that of during exercise</li> <li>• Compare and contrast ethanol fermentation and lactic acid fermentation</li> <li>• Use indicator chemicals to test for the movement of molecules</li> <li>• Determine direction and diffusion</li> <li>• Analyze the process of osmosis in living cells</li> <li>• Write a detailed lab report citing all steps in the scientific method</li> </ul>	<p>A, B, C</p>	<p><b>Process</b> 1.1, 1.2, 1.3, 3.1, 3.2, 3.3, 3.4, 3.5, 4.1, 4.2, 4.3, 4.4, 4.5, 4.6, 4.7, 4.8, 5.1, 5.2, 5.3, 6.1, 6.2, 6.3, 6.4</p>

<p><b>Heredity</b> Students will:</p> <ul style="list-style-type: none"> <li>• Demonstrate knowledge of the stages of meiosis</li> <li>• Demonstrate an understanding of the changes in chromosome number that occur during meiosis and fertilization</li> <li>• Compare meiosis I with meiosis II I terms of the position of the chromosomes in each stage, changes in chromosome number and daughter cells</li> <li>• Simulate the process of crossing-over between homologous chromosomes</li> <li>• Draw and complete Punnett squares and use them to determine genetic probabilities in monohybrid crosses</li> <li>• Write a detailed lab report citing all steps in the scientific method</li> </ul>	<p>A, C, F</p>	<p><b>Process</b> 1.1, 1.2, 1.3, 3.1, 3.2, 3.3, 3.4, 3.5, 4.1, 4.2, 4.3, 4.4, 4.5, 4.6, 4.7, 4.8, 5.1, 5.2, 5.3, 6.1, 6.2, 6.3, 6.4</p>
<p><b>Genetics</b> Students will:</p> <ul style="list-style-type: none"> <li>• Determine genotypes using pedigree charts</li> <li>• Examine why more males express x-linked traits</li> <li>• Solve genetic problems involving dominate-recessive inheritance, x-linked traits, multiple allele traits and codominance</li> <li>• Graphing the evolutionary relationship between sickle-cell disease and malaria</li> <li>• Write a detailed lab report citing all steps in the scientific method</li> </ul>	<p>A, C, F</p>	<p><b>Process</b> 1.1, 1.2, 1.3, 3.1, 3.2, 3.3, 3.4, 3.5, 4.1, 4.2, 4.3, 4.4, 4.5, 4.6, 4.7, 4.8, 5.1, 5.2, 5.3, 6.1, 6.2, 6.3, 6.4</p>

<p><b>DNA</b> Students will:</p> <ul style="list-style-type: none"> <li>• Demonstrate DNA structure and base-pairing rule</li> <li>• Create charts explaining the roles of protein synthesis including; DNA, mRNA, tRNA and ribosomes</li> <li>• Form a model of transcription and translation from a strand of DNA</li> <li>• Determine the sequence of amino acids in the polypeptide chain resulting from translation and transcription</li> <li>• Research changes in DNA code and how it may affect protein synthesis</li> <li>• Research the health affects of changes in the DNA code</li> <li>• Observe some DNA fingerprints</li> <li>• Analyze some similarities and differences between samples of DNA fingerprints</li> <li>• Write a detailed lab report citing all steps in the scientific method</li> </ul>	<p>A, B, C, F</p>	<p><b>Process</b> 1.1, 1.2, 1.3, 3.1, 3.2, 3.3, 3.4, 3.5, 4.1, 4.2, 4.3, 4.4, 4.5, 4.6, 4.7, 6.1, 6.2, 6.3, 6.4</p>
<p><b>Ecology</b> Students will:</p> <ul style="list-style-type: none"> <li>• Estimate the size of a population using methods of sampling</li> <li>• Create ecological quadrants for prediction</li> <li>• Calculate percent error</li> <li>• Graph population size and error</li> <li>• Analyze real-life situations where this could be helpful</li> <li>• Write a detailed lab report citing all steps in the scientific method</li> </ul>	<p>A, C, F</p>	<p><b>Process</b> 1.1, 1.2, 1.3, 3.1, 3.2, 3.3, 3.4, 3.5, 4.1, 4.2, 4.3, 4.4, 4.5, 4.6, 4.7, 5.1, 5.2, 5.3, 6.1, 6.2, 6.3, 6.4</p>

<p><b>Microscope</b> Students will:</p> <ul style="list-style-type: none"> <li>• Identify the parts of a compound and dissecting microscopes and the functions</li> <li>• Choose correct type of microscope for sample viewing</li> <li>• Focus the compound microscope using scanning, low-, high-powered lenses</li> <li>• Prepare a wet mount slide</li> <li>• Correct viewing problems that commonly occur when using a compound microscope</li> <li>• Use the microscope to test a hypothesis</li> <li>• Write a detailed lab report citing all steps in the scientific method</li> </ul>	<p>A, E</p>	<p><b>Process</b> 1.1, 1.2, 1.3, 3.1, 3.2, 3.3, 3.4, 3.5, 4.1, 4.2, 4.3, 4.4, 4.5, 4.6, 4.7, 5.1, 5.2, 5.3, 6.1, 6.2, 6.3, 6.4</p>
<p><b>Nutrition</b> Students will:</p> <ul style="list-style-type: none"> <li>• Test an unknown sample for the presents of organic molecules</li> <li>• Relate the nutrient content of a food to its original function in plants and animals</li> <li>• Discuss the benefits and drawbacks of using carbohydrates vs. lipids as energy storage molecules for embryos</li> <li>• Chart the Federal Dietary Guidelines</li> <li>• Analyze the nutritional value of your meals</li> <li>• Write a detailed lab report citing all steps in the scientific method</li> </ul>	<p>A, B, C, F</p>	<p><b>Process</b> 1.1, 1.2, 1.3, 3.1, 3.2, 3.3, 3.4, 3.5, 4.1, 4.2, 4.3, 4.4, 4.5, 4.6, 4.7, 4.8, 5.1, 5.2, 5.3, 6.1, 6.2, 6.3, 6.4</p>

<p><b>Skin</b> Students will:</p> <ul style="list-style-type: none"> <li>• Observe fresh skin cells under a microscope</li> <li>• Observe the layers of the skin on prepared slides</li> <li>• Discuss the functions of each layer</li> <li>• Observe sample of cells from individuals own mouth</li> <li>• Discuss the similarities and differences of the two slides</li> <li>• Create and label a diagram of skin layers including major function</li> <li>• Analyze the function and the arrangement for each part of a cell</li> <li>• Discuss adaptations of epithelial tissue that demonstrate the relationship between structure and function</li> <li>• Write a detailed lab report citing all steps in the scientific method</li> </ul>	<p>A, C, E</p>	<p><b>Process</b> 1.1, 1.2, 1.3, 3.1, 3.2, 3.3, 3.4, 3.5, 4.1, 4.2, 4.3, 4.4, 4.5, 4.6, 4.7, 6.1, 6.2, 6.3, 6.4</p>
<p><b>Animals</b> Students will:</p> <ul style="list-style-type: none"> <li>• Observe external features of preserved female and male animal</li> <li>• Observe/ dissect preserved animal for view of body systems</li> <li>• Locate organs</li> <li>• Discuss how organs are specialized to perform specific functions</li> <li>• Compare and contrast the features with that of a human</li> <li>• Write a detailed lab report citing all steps in the scientific method</li> </ul>	<p>A, C</p>	<p><b>Process</b> 1.1, 1.2, 1.3, 3.1, 3.2, 3.3, 3.4, 3.5, 4.1, 4.2, 4.3, 4.4, 4.5, 4.6, 4.7, 6.1, 6.2, 6.3, 6.4</p>

## Resources

### Standards

*National Science Standards* (5<sup>th</sup> ed). (1998). National Research Council, Washington, D.C., National Academy of Sciences

*Oklahoma Priority Academic Student Skills* (2003). Oklahoma State Department of Education-PASS-[www.sde.state.ok.us](http://www.sde.state.ok.us)

### Textbooks

Freeman, Scott (2005) *Biological Science* (2<sup>nd</sup> ed.) Upper Saddle River, New Jersey: Pearson Education, Inc.

Starr, Cecie, Taggart, Ralph (2006) *Biology: The Unity and Diversity of Life* (11<sup>th</sup> ed.) Thomson Books/Cole.

Simon, Eric, Reece, Jane, Campbell, Neil, Taylor, Martha (2006) *Biology Concepts and Connections* (5<sup>th</sup> ed.) San Francisco, CA: Pearson Education Inc./Benjamin Cummings.

Audersirk, Teresa, Audersirk, Gerald, Byers, Bruce (2005) *Biology: Life on Earth* (7<sup>th</sup> ed.) Upper Saddle River, New York: Pearson/Prentice Hall Education.

## Supplemental

### Website

*The Biology Place*- Learning resource for college-level biology. Offers study guides, customized tests, lab tutorial, online activities. Membership comes with purchase of Campbell textbook, otherwise there is a fee.

<http://www.biology.com/>

*Genetic Science Learning Center*—features hands-on labs and tutorials. Reinforces genetics, DNA, electrophoresis, mutations, cell structure, etc. Free website.

<http://gsic.genetics.utah.edu/>

### Software

*Ecobeaker*- Inquiry-based labs covering ecology, environmental biology, & evolution. Virtual experimentation. Cost \$599.00 Symbiotic Software 148 Grandview Court Ithaca, NY 14850 <http://www.simbio.com/index.html>

### Laboratory Manuals

Dickey, Jean (1995) *Laboratory Investigation for Biology* Redwood City, CA: Benjamin Cummings Publishing Company.

Kosinski, Robert J., Helms, Doris R., Helms, Carl W., Cummings, John R. (2000) *Biology in the Laboratory* (3<sup>rd</sup> ed.) New York, NY: W.H. Freeman and Company.

Vodopich, Darrel S., Moore, Randy (1996) *Biology Laboratory Manual* (4<sup>th</sup> ed.) Boston , MA: WCB McGraw-Hill.