



<b>Course: Biology 9</b> <b>Grade: 9th</b> <b>Designer(s):</b> <b>Monteleone/Helmkamp/Watkins</b>	<b>Overview of Course</b> (Briefly describe what students should understand and be able to do as a result of engaging in this course):  <p><b>This course presents an in-depth insight into the nature of life and its inter-relationship with matter and energy. The following topics will be studied: cell structure, chemical and physical cell processes, principles of heredity, genetics, living organisms observed from an evolutionary viewpoint, and the relationship of organisms to each other and to their environment. Computer technology is used to enhance study.</b></p>
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**Overarching Big Ideas, Enduring Understandings, and Essential Questions**  
 (These “spiral” throughout the entire curriculum.)

<b>Big Idea</b> (A Big Idea is typically a noun and always transferable within and among content areas.)	<b>Standard(s) Addressed</b> (What Common Core Standard(s) and/or PA Standard(s) addresses this Big Idea?)	<b>Enduring Understanding(s)</b> (SAS refers to Enduring Understandings as “Big Ideas.” EUs are the understandings we want students to carry with them after they graduate. EUs will link Big Ideas together. Consider having only one or two EUs per Big Idea.)	<b>Essential Question(s)</b> (Essential Questions are broad and open ended. Sometimes, EQs can be debated. A student’s answer to an EQ will help teachers determine if he/she truly understands. Consider having only one or two EQs per Enduring Understanding.)
(The first overarching Big Idea goes here.)  <b>Systems</b>	(The Common Core Standard(s) and/or PA Standard(s) that addresses the first overarching Big Idea goes here.)  <b>Keystone Assessment Anchors</b> <b>BIO.A.1</b> <b>BIO.A.2</b> <b>BIO.A.3</b> <b>BIO.A.4</b> <b>BIO.B.1</b> <b>BIO.B.2</b> <b>BIO.B.3</b> <b>BIO.B.4</b>	(The Enduring Understanding(s) for the first overarching Big Idea goes here.)  <b>Systems are made up of smaller interdependent parts that work together to make the system function.</b>	(The Essential Question(s) for the Enduring Understanding(s) for the first overarching Big Idea goes here.)  <b>How are smaller parts of a system interdependent?</b>  <b>How is a system dependent on its smaller parts to function?</b>

<b>Cycles</b>	Same as above	<b>Matter is recycled over and over again.</b>  Cycles are necessary.	<b>Why is a cycle necessary?</b>
<b>Environments</b>	Same as above	<b>Environments provide materials or conditions that surround an individual.</b>	<b>What does an environment provide?</b>
<b>Structure &amp; Function</b>	Same as above	<b>Structure is related to function.</b>	<b>How is structure related to function?</b>  <b>How does life result from structure and function?</b>
<b>Energy</b>	Same as above	<b>Energy is necessary to carry out functions.</b>	<b>Where does energy come from?</b>  <b>How is energy obtained and used for functions?</b>

**Big Ideas, Enduring Understandings, and Essential Questions Per Unit of Study**  
(These do NOT “spiral” throughout the entire curriculum, but are specific to each unit.)

<b>Month of Instruction</b> (In what month(s) will you teach this unit?)	<b>Title of Unit</b>	<b>Big Idea(s)</b> (A Big Idea is typically a noun and always transferable within and among content areas.)	<b>Standard(s) Addressed</b> (What Common Core Standard(s) and/or PA Standard(s) addresses this Big Idea?)	<b>Enduring Understanding(s)</b> (SAS refers to Enduring Understandings as “Big Ideas.” EUs are the understandings we want students to carry with them after they graduate. EUs will link Big Ideas together. Consider having only one or two EUs per Big Idea.)	<b>Essential Question(s)</b> (Essential Questions are broad and open ended. Sometimes, EQs can be debated. A student’s answer to an EQ will help teachers determine if he/she truly understands. Consider having only one or two EQs per Enduring Understanding.)	<b>Common Assessment(s)</b> * (What assessments will all teachers of this unit use to determine if students have answered the Essential Questions?)	<b>Common Resource(s)* Used</b> (What resources will all teachers of this unit use to help students understand the Big Ideas?)
<b>1<sup>st</sup> semester</b>							
August (1 week)	Scientific Method	Reasoning Analysis	S11.A.1.1 Analyze and explain the nature of science in the search for	The process of science helps biologists	What role does science play in the study of life?	Questions on the Midterm	

		Processes	<p>understanding the natural world and its connection to technological systems.</p> <p>S11.A.1.2 Identify and analyze the scientific challenges of societal issues; propose possible solutions and discuss implications.</p> <p>S11.A.1.3 Describe and interpret patterns of change in natural and human-made systems.</p> <p>S11.A.2.1 Apply knowledge of scientific investigation or technological design to develop or critique aspects of the experimental design process.</p>	investigate how nature works at all levels.			
September/ October (7-8 weeks)	Ecology	<b>Cycles Environment Energy Relationships Matter</b>	<p>BIO.A.1.1 Explain the characteristics common to all organisms.</p> <p>BIO.A.2.1 Describe how the unique properties of water support life on Earth.</p> <p>BIO.B.4.1 Describe ecological levels of organization in the biosphere.</p> <p>BIO.B.4.2 Describe interactions and relationships in an ecosystem.</p> <p>Enhanced Standards: 3.1.B.A1 3.1.B.A2 3.1.B.A5 3.1.B.A8 3.1.B.C2 4.1.3.A 4.1.3.C 4.1.4.A 4.1.4.B</p>	Organisms on Earth interact and depend in a variety of ways on other living and nonliving things in their environments.	<p>How do organisms interact and depend on each other and their environment for survival?</p> <p>How do abiotic and biotic factors shape ecosystems?</p> <p>What factors contribute to changes in populations?</p> <p>How have human activities shaped local and global ecology?</p>	Questions on the Midterm	

4.2.8.A  
4.2.10.A  
4.2.10.B  
4.2.10.C  
4.2.12.A  
4.2.12.B  
4.2.12.C  
4.3.4.D  
4.3.10.B  
4.3.12.A  
4.4.3.C  
4.4.5.C  
4.4.6.A  
4.4.6.B  
4.5.3.D  
4.5.4.C  
4.5.5.D  
4.5.6.D

			4.1.4.C 4.1.4.E 4.1.5.A 4.1.5.C 4.1.7.A 4.1.7.B 4.1.7.C 4.1.7.E 4.1.10.A 4.1.10.B 4.1.10.C 4.1.10.E 4.1.12.A 4.1.12.C 4.2.5.A 4.2.5.C 4.2.7.A				
November (3 weeks)	Biochemistry	<b>Energy Structure &amp; Function Cycles Matter</b>	<p>BIO.A.2.1 Describe how the unique properties of water support life on Earth.</p> <p>BIO.A.2.2 Describe and interpret relationships between structure and function at various levels of biochemical organization (i.e., atoms, molecules, and macromolecules).</p> <p>BIO.A.2.3 Explain how enzymes regulate biochemical reactions within a cell.</p> <p>BIO.A.4.2 Explain mechanisms that permit organisms to maintain biological balance between their internal and external environments.</p> <p>Enhanced Standards:  3.1.BA2  3.1.BA5  3.1.BA7  3.1.BA8  3.1.CA2</p>	Life emerges due to the chemical organization of matter into cells.	What are the basic chemical principles that affect living things?  How does life result from chemical structure and function?  How are the properties of water essential for life?	Questions on the Midterm	

			3.1.C.A7 4.2.4.C 4.2.5.C 4.5.4.D				
November/ December/ January/ February (10 weeks)	Cell Biology	<b>Systems Structure &amp; Function Energy Homeostasis Transport</b>	<p>BIO.A.1.1 Explain the characteristics common to all organisms.</p> <p>BIO.A.1.2 Describe relationships between structure and function at biological levels of organization.</p> <p>BIO.A.2.3 Explain how enzymes regulate biochemical reactions within a cell.</p> <p>BIO.A.3.1 Identify and describe the cell structures involved in processing energy.</p> <p>BIO.A.3.2 Identify and describe how organisms obtain and transform energy for their life processes.</p> <p>BIO.A.4.1 Identify and describe the cell structures involved in transport of materials into, out of, and throughout a cell.</p> <p>BIO.A.4.2 Explain mechanisms that permit organisms to maintain biological balance between their internal and external environments.</p> <p>BIO.B.1.1 Describe the three stages of the cell cycle: interphase, nuclear division, cytokinesis.</p> <p>BIO.B.2.2</p>	<p>Organisms share common characteristics of life.</p> <p>A cell is the basic unit of life; the processes that occur at the cellular level provide the energy and basic structure organisms need to survive.</p> <p>New cells arise from the division of pre-existing cells.</p> <p>DNA is the universal code for life.</p>	<p>How do we know something is alive?</p> <p>How are cell structures adapted to their functions?</p> <p>How do organisms obtain energy?</p> <p>How does a cell produce a new cell?</p> <p>How does DNA direct proteins?</p>	Questions on the Midterm	

			<p>Explain the process of protein synthesis (i.e., transcription, translation, and protein modification).</p> <p>BIO.B.1.1 Describe the three stages of the cell cycle: interphase, nuclear division, cytokinesis</p> <p>BIO.B.2.2 Explain the process of protein synthesis (i.e., transcription, translation, and protein modification).</p> <p>Enhanced Standards:  3.1.B.A1  3.1.B.A2  3.1.B.A4  3.1.B.A5  3.1.B.A6  3.1.B.A7  3.1.B.A8  3.1.B.B1  3.1.B.B2  3.1.B.B3  3.1.B.B5  3.1.B.C2  3.1.C.A1  3.1.C.A2  3.1.C.C2  3.1.C.B3  3.2.C.A1  3.2.P.B6  4.1.3.A  4.1.4.A  4.1.10.C  4.2.4.C  4.5.4.D</p>				
<b>2<sup>nd</sup> semester</b>							
February/ March (4 weeks)	Genetics	<b>Cycles</b> Reproduction Heredity	BIO.B.1.2 Explain how genetic information is inherited.	DNA is the universal code for life.	What is the structure of DNA and how does it function in genetic		

			<p>BIO.B.2.1 Compare Mendelian and non-Mendelian patterns of inheritance.</p> <p>BIO.B.2.3 Explain how genetic information is expressed.</p> <p>BIO.B.2.4 Apply scientific thinking, processes, tools, and technologies in the study of genetics.</p> <p>Enhanced Standards: 3.1.B.A4 3.1.B.A5 3.1.B.B1 3.1.B.B2 3.1.B.B3 3.1.B.B4 3.1.B.B5 3.1.B.C2 3.1.C.B3 3.1.C.C2 4.4.7.A 4.4.7.B 4.4.10.A 4.4.10.B 4.4.12.A 4.4.12.B</p>	<p>DNA enables an organism to transmit hereditary information and, along with the environment, determines an organism's characteristics.</p>	<p>inheritance?</p> <p>How does cellular information pass from one generation to another?</p> <p>How can we use genetics to study human inheritance?</p> <p>How and why do scientists manipulate DNA in living cells?</p>		
<p>April (3 weeks)</p>	<p>Evolution Taxonomy</p>	<p><b>Structure &amp; Function</b> <b>Environments</b> Evolution Taxonomy</p>	<p>BIO.A.1.1 Explain the characteristics common to all organisms.</p> <p>BIO.B.3.1 Explain the mechanisms of evolution.</p> <p>BIO.B.3.2 Analyze the sources of evidence for biological evolution.</p> <p>BIO.B.3.3 Apply scientific thinking, processes, tools, and technologies in the study of</p>	<p>Evolution is the result of many random processes selecting for the survival and reproduction of a population.</p>	<p>How do we scientifically explain the evidence and mechanisms for biological evolution?</p> <p>What is natural selection?</p> <p>How can populations evolve to form new species?</p>		

			<p>the theory of evolution.</p> <p>Enhanced Standards:  3.1.B.A1  3.1.B.A9  3.1.B.B1  3.1.B.B3  3.1.B.C1  3.1.B.C2  3.1.B.C3  4.1.3.A  4.1.4.A</p>				
May (2-3 weeks)	Viruses Bacteria	<b>Structure &amp; Function</b> Taxonomy Diversity	<p>BIO.A.1.1 Explain the characteristics common to all organisms.</p> <p>BIO.A.1.2 Describe relationships between structure and function at biological levels of organization.</p> <p>Enhanced Standards:  3.1.B.A1  3.1.B.A5  3.1.B.A6  3.1.B.C2  4.1.3.A  4.1.4.A</p>	From microorganisms to plants, organisms vary widely in the way they carry out basic life processes.	<p>How do organisms carry out basic life processes?</p> <p>What is the goal of biologists who classify living things?</p>	Research Project	

\* Some teachers may need to think about the assessments and resources used in order to determine the Big Ideas, Enduring Understandings, and Essential Questions embedded in their courses. At this point in your curriculum mapping, you might want to ignore the “Common Assessments” and “Common Resources Used” columns. However, you may use them if you wish.