

# Phoenixville Area School District Understanding by Design (UbD) Science Unit Plan

Grade Level &/or HS Subject: **BIOLOGY**

Unit Name: **ENERGY IN ORGANISMS**

Stage 1 Desired Results		
<b>Overarching NGSS &amp; PA Standards:</b>  <b>HS-LS1-5</b>  <b>HS-LS1-7</b>  <b>HS-LS2-3</b>  <b>HS-LS2-5</b>   <b>Which branch(es) of science apply:</b>  <b>BIOLOGY</b>	<b>Transfer</b>  <i>Students will be able to independently use their learning to...</i> <ul style="list-style-type: none"> <li>• develop and use models.</li> <li>• construct explanations and design solutions.</li> </ul> (Choose the appropriate content-specific transfer goals)	
	<b>Meaning-Making</b>  <i>Students will understand that...</i> <ul style="list-style-type: none"> <li>• photosynthesis transforms light energy into stored chemical energy.</li> <li>• cellular respiration is a chemical process whereby the bonds of food molecules and oxygen molecules are broken and the bonds in new compounds are formed, resulting in a net transfer of energy</li> <li>• there is a cycling of matter and flow of energy in aerobic and anaerobic conditions.</li> <li>• there is a role of photosynthesis and cellular respiration in the cycling of carbon among the biosphere, atmosphere, hydrosphere, and geosphere.</li> </ul>	<b>ESSENTIAL QUESTIONS</b> <i>Students will keep considering...</i> <ul style="list-style-type: none"> <li>• How do organisms obtain and use the matter and energy they need to live and grow?</li> <li>• How do organisms interact with the living and nonliving environments to obtain matter and energy?</li> </ul>
	<b>Knowledge and Skills Acquisition</b>  <b>UNDERSTANDINGS</b>	
	<i>Students will know...</i> <ul style="list-style-type: none"> <li>• the process of photosynthesis converts light energy to stored chemical energy by converting carbon dioxide plus water into sugars plus released oxygen.</li> <li>• as matter and energy flow through different organizational levels of living systems, chemical elements are recombined in different ways to form different products.</li> <li>• as a result of chemical reactions, energy is transferred from one system of interacting molecules to another. Cellular respiration is a chemical process in which the bonds of food molecules and oxygen molecules are broken, and new compounds are formed that can transport</li> </ul>	<i>Students will be skilled at...</i> <ul style="list-style-type: none"> <li>• using models based on evidence to illustrate the relationships between systems or between components of a system.</li> <li>• Constructing and revising explanations based on valid and reliable evidence</li> </ul>

	<p>energy to muscles. Cellular respiration also releases the energy needed to maintain body temperature despite ongoing energy transfer to the surrounding environment.</p> <ul style="list-style-type: none"> <li>• photosynthesis and cellular respiration (including anaerobic processes) provide most of the energy for life processes.</li> <li>• photosynthesis and cellular respiration are important components of the carbon cycle, in which carbon is exchanged among the biosphere, atmosphere, oceans, and geosphere through chemical, physical, geological, and biological processes.</li> <li>• the main way that solar energy is captured and stored on Earth is through the complex chemical process known as photosynthesis.</li> <li>• the fundamental roles of plastids (e.g., chloroplasts) and mitochondria in energy transformations. *</li> <li>• the basic transformation of energy during photosynthesis and cellular respiration.*</li> <li>• the role of ATP in biochemical reactions.*</li> <li>• how matter recycles through an ecosystem*</li> </ul>	<p>obtained from a variety of sources (including students' own investigations, models, theories, simulations, peer review) and the assumption that theories and laws that describe the natural world operate today as they did in the past and will continue to do so in the future.</p>
	<p style="text-align: center;"><b>KEY VOCABULARY</b></p> <p>Aerobic, Anaerobic, ATP, Autotroph, Biochemical reaction, Carbon Fixation, Cellular Respiration, Chloroplast, Endergonic, Exergonic, Geochemical Cycle, Heterotroph, Metabolic pathway, Mitochondria, Photosynthesis</p>	

## Stage 2 – Evidence

<b>Evaluative Criteria</b>	<b><i>Assessment Evidence</i></b>	
What criteria will be used in each assessment to evaluate attainment of the desired results?	<p style="text-align: center;"><b>PERFORMANCE TASK(S):</b></p> <ul style="list-style-type: none"> <li>• Photosynthesis Inquiry Lab</li> <li>• Ecosystem Energy Transfer Model</li> </ul>	<p><b>Differentiation Considerations:</b></p> <ul style="list-style-type: none"> <li>• Grouping of students</li> <li>• Split Screen Activities</li> <li>• Scaffolding of Information</li> </ul>
What criteria will be used in each assessment to evaluate attainment of the desired results?	<p style="text-align: center;"><b>OTHER EVIDENCE:</b></p> <ul style="list-style-type: none"> <li>• Quizzes and Unit Exams</li> <li>• Virtual Labs – OPTIONAL</li> <li>• Sketch Notes – OPTIONAL</li> </ul>	<p><b>Differentiation Considerations:</b></p> <ul style="list-style-type: none"> <li>• Grouping of students</li> <li>• Split Screen Activities</li> <li>• Scaffolding of Information</li> </ul>