

CHEMISTRY

HS-LS1-7: From Molecules to Organisms: Structures and Processes

[HS-LS1-7: Use a model to illustrate that 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](#)

Clarification Statement: Emphasis is on the conceptual understanding of the inputs and outputs of the process of cellular respiration.

Assessment Boundary: Assessment should not include identification of the steps or specific processes involved in cellular respiration.

[Evidence Statements: HS-LS1-7](#)

Science & Engineering Practices	Disciplinary Core Ideas	Cross-Cutting Concepts
<p>Developing and Using Models</p> <p>Modeling in 9–12 builds on K–8 experiences and progresses to using, synthesizing, and developing models to predict and show relationships among variables between systems and their components in the natural and designed worlds.</p> <p>Use a model based on evidence to illustrate the relationships between systems or between components of a system.</p>	<p>LS1.C: Organization for Matter and Energy Flow in Organisms</p> <p>As matter and energy flow through different organizational levels of living systems, chemical elements are recombined in different ways to form different products.</p> <p>As a result of these 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 energy to muscles. Cellular respiration also releases the energy needed to maintain body temperature despite ongoing energy transfer to the surrounding environment.</p>	<p>Energy and Matter</p> <p>Energy cannot be created or destroyed—it only moves between one place and another place, between objects and/or fields, or between systems.</p>

Connections to other DCIs in this grade-band: HS.PS1.B ; HS.PS2.B ; HS.PS3.B

Articulation of DCIs across grade-bands: MS.PS1.B ; MS.PS3.D ; MS.LS1.C ; MS.LS2.B

NJSLS- ELA: SL.11-12.5

NJSLS- Math: N/A

5E Model

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Engage Anticipatory Set	<p>ATP & Respiration: Crash Course Video https://www.youtube.com/watch?v=00jbG_cfGuQ</p>
Exploration Student Inquiry	<p>How Do Organisms Use Energy? http://serendip.brynmawr.edu/exchange/files/how%20organisms%20use%20energy%20SHO.docx</p> <p>Students will read through the notes/worksheet and answer questions.</p> <p>Photosynthesis Chemistry Models http://www.ngsslifescience.com/science.php?/biology/lessonplans/C455</p> <p>The activity can be done in reverse to show how glucose and oxygen are broken down*</p>
Explanation Concepts and Practices	<p>In these lessons</p> <p>Teachers Should: Introduce formal labels, definitions, and explanations for concepts, practices, skills or abilities. Students Should: Verbalize conceptual understandings and demonstrate scientific and engineering practices.</p> <p>Topics to Be Discussed in Teacher Directed Lessons (Disciplinary Core Ideas): LS1.C: Organization for Matter and Energy Flow in Organisms As matter and energy flow through different organizational levels of living systems, chemical elements are recombined in different ways to form different products.</p>

	<p>As a result of these 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 energy to muscles. Cellular respiration also releases the energy needed to maintain body temperature despite ongoing energy transfer to the surrounding environment.</p>
<p>Elaboration Extension Activity</p>	<p><u>Food, Energy and Body Weight</u></p> <p>This analysis and discussion activity reinforces student understanding of cellular respiration and helps students to understand the relationships between food, energy, physical activity, and changes in body weight.</p> <p>The first attached file has the Student Handout and the second attached file has the Teacher Notes. The Teacher Notes provide background information and instructional suggestions and explain how this activity is aligned with the Next Generation Science Standards</p> <p>http://serendip.brynmawr.edu/exchange/files/FoodEnergyWtTN_0.docx</p>
<p>Evaluation Assessment Tasks</p>	<p><u>Assessment Task A: Driving Question Response</u></p> <p>Response should include the relationships between these components:</p> <p>Carbon dioxide and water are produced from sugar and oxygen by the process of cellular respiration</p> <p>The process of cellular respiration releases energy because the energy released when the bonds that are formed in CO₂ and water is greater than the energy required to break the bonds of sugar and oxygen.</p>