

## 5. Matter and Energy in Organisms and Ecosystems

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Students who demonstrate understanding can:

- 5-PS3-1. Use models to describe that energy in animals' food (used for body repair, growth, motion, and to maintain body warmth) was once energy from the sun.** [Clarification Statement: Examples of models could include diagrams, and flow charts.]
- 5-LS1-1. Support an argument that plants get the materials they need for growth chiefly from air and water.** [Clarification Statement: Emphasis is on the idea that plant matter comes mostly from air and water, not from the soil.]
- 5-LS2-1. Develop a model to describe the movement of matter among plants, animals, decomposers, and the environment.** [Clarification Statement: Emphasis is on the idea that matter that is not food (air, water, decomposed materials in soil) is changed by plants into matter that is food. Examples of systems could include organisms, ecosystems, and the Earth.] [Assessment Boundary: Assessment does not include molecular explanations.]

The performance expectations above were developed using the following elements from the NRC document *A Framework for K-12 Science Education*:

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
<p><b>Developing and Using Models</b> Modeling in 3–5 builds on K–2 experiences and progresses to building and revising simple models and using models to represent events and design solutions.</p> <ul style="list-style-type: none"> <li>▪ Use models to describe phenomena. (5-PS3-1)</li> <li>▪ Develop a model to describe phenomena. (5-LS2-1)</li> </ul> <p><b>Engaging in Argument from Evidence</b> Engaging in argument from evidence in 3–5 builds on K–2 experiences and progresses to critiquing the scientific explanations or solutions proposed by peers by citing relevant evidence about the natural and designed world(s).</p> <ul style="list-style-type: none"> <li>▪ Support an argument with evidence, data, or a model. (5-LS1-1)</li> </ul> <p style="text-align: center;">-----</p> <p style="text-align: center;"><i>Connections to Nature of Science</i></p> <p><b>Science Models, Laws, Mechanisms, and Theories Explain Natural Phenomena</b></p> <ul style="list-style-type: none"> <li>▪ Science explanations describe the mechanisms for natural events. (5-LS2-1)</li> </ul>	<p><b>PS3.D: Energy in Chemical Processes and Everyday Life</b></p> <ul style="list-style-type: none"> <li>▪ The energy released [from] food was once energy from the sun that was captured by plants in the chemical process that forms plant matter (from air and water). (5-PS3-1)</li> </ul> <p><b>LS1.C: Organization for Matter and Energy Flow in Organisms</b></p> <ul style="list-style-type: none"> <li>▪ Food provides animals with the materials they need for body repair and growth and the energy they need to maintain body warmth and for motion. (<i>secondary to 5-PS3-1</i>)</li> <li>▪ Plants acquire their material for growth chiefly from air and water. (5-LS1-1)</li> </ul> <p><b>LS2.A: Interdependent Relationships in Ecosystems</b></p> <ul style="list-style-type: none"> <li>▪ The food of almost any kind of animal can be traced back to plants. Organisms are related in food webs in which some animals eat plants for food and other animals eat the animals that eat plants. Some organisms, such as fungi and bacteria, break down dead organisms (both plants or plants parts and animals) and therefore operate as “decomposers.” Decomposition eventually restores (recycles) some materials back to the soil. Organisms can survive only in environments in which their particular needs are met. A healthy ecosystem is one in which multiple species of different types are each able to meet their needs in a relatively stable web of life. Newly introduced species can damage the balance of an ecosystem. (5-LS2-1)</li> </ul> <p><b>LS2.B: Cycles of Matter and Energy Transfer in Ecosystems</b></p> <ul style="list-style-type: none"> <li>▪ Matter cycles between the air and soil and among plants, animals, and microbes as these organisms live and die. Organisms obtain gases, and water, from the environment, and release waste matter (gas, liquid, or solid) back into the environment. (5-LS2-1)</li> </ul>	<p><b>Systems and System Models</b></p> <ul style="list-style-type: none"> <li>▪ A system can be described in terms of its components and their interactions. (5-LS2-1)</li> </ul> <p><b>Energy and Matter</b></p> <ul style="list-style-type: none"> <li>▪ Matter is transported into, out of, and within systems. (5-LS1-1)</li> <li>▪ Energy can be transferred in various ways and between objects. (5-PS3-1)</li> </ul>
<p><i>Connections to other DCIs in fifth grade: 5.ESS2.A (5-LS2-1); 5.PS1.A (5-LS1-1),(5-LS2-1)</i></p> <p><i>Articulation of DCIs across grade-bands: K.LS1.C (5-LS1-1),(5-PS3-1); 2.PS1.A (5-LS2-1); 2.LS2.A (5-PS3-1),(5-LS1-1); 2.LS4.D (5-LS2-1); 4.PS3.A (5-PS3-1); 4.PS3.B (5-PS3-1); 4.PS3.D (5-PS3-1); 4.ESS2.E (5-LS2-1); MS.PS3.D (5-PS3-1),(5-LS2-1); MS.PS4.B (5-PS3-1); MS.LS1.C (5-PS3-1),(5-LS1-1),(5-LS2-1); MS.LS2.A (5-LS2-1); MS.LS2.B (5-PS3-1),(5-LS2-1)</i></p>		
<p><i>Common Core State Standards Connections:</i></p> <p><i>ELA/Literacy –</i></p> <p><b>RI.5.1</b> Quote accurately from a text when explaining what the text says explicitly and when drawing inferences from the text. (<i>5-LS1-1</i>)</p> <p><b>RI.5.7</b> Draw on information from multiple print or digital sources, demonstrating the ability to locate an answer to a question quickly or to solve a problem efficiently. (<i>5-PS3-1),(5-LS2-1</i>)</p> <p><b>RI.5.9</b> Integrate information from several texts on the same topic in order to write or speak about the subject knowledgeably. (5-LS1-1)</p> <p><b>W.5.1</b> Write opinion pieces on topics or texts, supporting a point of view with reasons and information. (5-LS1-1)</p> <p><b>SL.5.5</b> Include multimedia components (e.g., graphics, sound) and visual displays in presentations when appropriate to enhance the development of main ideas or themes. (<i>5-PS3-1),(5-LS2-1</i>)</p> <p><i>Mathematics –</i></p> <p><b>MP.2</b> Reason abstractly and quantitatively. (<i>5-LS2-1</i>)</p> <p><b>MP.4</b> Model with mathematics. (<i>5-LS2-1</i>)</p> <p><b>5.MD.A.1</b> Convert among different-sized standard measurement units within a given measurement system (e.g., convert 5 cm to 0.05 m), and use these conversions in solving multi-step, real world problems. (<i>5-LS1-1</i>)</p>		

\*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

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