Unless otherwise specified, "descriptions" referenced in the evidence statements could include but are not limited to written, oral, pictorial, and kinesthetic descriptions.

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

Students who demonstrate understanding can:

MS-LS1-7. **Develop a model to describe how food is rearranged through chemical reactions forming new molecules that support growth and/or release energy as this matter moves through an organism.** [Clarification Statement: Emphasis is on describing that molecules are broken apart and put back together and that in this process, energy is released.] [*Assessment Boundary: Assessment does not include details of the chemical reactions for photosynthesis or respiration.*]

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

Science and Engineering Practices

Developing and Using Models

Modeling in 6–8 builds on K–5 experiences and progresses to developing, using, and revising models to describe, test, and predict more abstract phenomena and design systems.

- Develop a model to describe unobservable mechanisms.

Disciplinary Core Ideas

LS1.C: Organization for Matter and Energy Flow in Organisms

- Within individual organisms, food moves through a series of chemical reactions in which it is broken down and rearranged to form new molecules, to support growth, or to release energy.

PS3.D: Energy in Chemical Processes and Everyday Life

- Cellular respiration in plants and animals involve chemical reactions with oxygen that release stored energy. In these processes, complex molecules containing carbon react with oxygen to produce carbon dioxide and other materials.*(secondary)*

Crosscutting Concepts

Energy and Matter

- Matter is conserved because atoms are conserved in physical and chemical processes.

Observable features of the student performance by the end of the course:

1	Components of the model		
	a	To make sense of a phenomenon, students develop a model in which they identify the relevant components for describing* how food molecules are rearranged as matter moves through an organism, including:	
		i.	Molecules of food, which are complex carbon-containing molecules.
		ii.	Oxygen.
		iii.	Energy that is released or absorbed during chemical reactions between food and oxygen.
		iv.	New types of molecules produced through chemical reactions involving food.
2	Relationships		
	a	In the model, students identify and describe* the relationships between components, including:	
		i.	During cellular respiration, molecules of food undergo chemical reactions with oxygen, releasing stored energy.
		ii.	The atoms in food are rearranged through chemical reactions to form new molecules.
3	Connections		
	a	Students use the model to describe*:	
		i.	The number of each type of atom being the same before and after chemical reactions, indicating that the matter ingested as food is conserved as it moves through an organism to support growth.
		ii.	That all matter (atoms) used by the organism for growth comes from the products of the chemical reactions involving the matter taken in by the organism.
		iii.	Food molecules taken in by the organism are broken down and can then be rearranged to become the molecules that comprise the organism (e.g., the proteins and other molecules in a hamburger can be broken down and used to make a variety of tissues in humans).
		iv.	As food molecules are rearranged, energy is released and can be used to support other processes within the organism.