

Educational Resources from *Phenomenon Science Education*
Student Proficiency Goals for Performance Expectation **HS-LS1-7**



Information about Performance Expectation HS-LS1-7

Performance Expectation 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 Limits.

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

Science and Engineering Practice (Developing and Using Models)

- Use a model based on evidence to illustrate the relationships between systems or between components of a system.

Disciplinary Core Idea (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.
- 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.

Crosscutting Concept (Energy and Matter)

- Energy cannot be created or destroyed—it only moves between one place and another place, between objects and/or fields, or between systems.

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SEP (Developing and Using Models):

- Students use a model to illustrate that cellular respiration is a chemical process that results in a net transfer of energy.
- Students use a model to illustrate that energy is used to break the bonds of food molecules and oxygen molecules and that energy is released as new bonds are formed in new compounds.
- Students use a model to illustrate the inputs and outputs of matter and energy that result from cellular respiration.
- Students use models to show the movement of matter and energy within and through cellular systems during respiration.

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

- Students know that cellular respiration is a chemical process in which the bonds of food molecules and oxygen molecules are broken, and new compounds are formed.
- Students know that compounds formed during cellular respiration can transport energy to muscles.
- Students know that during cellular respiration, energy is transferred from one system of interacting molecules to another system of molecules.
- Students know that cellular respiration can release energy required to maintain body temperature despite ongoing energy transfer from the body to the surrounding environment.
- Students know that as matter and energy flow through different organizational levels of a living system, chemical elements are recombined in different ways to form different products.

CCC (Energy and Matter):

- Students consider the flow of energy into, within, and out of systems, as chemical elements are recombined in different ways to form different products during cellular respiration.
- Students consider the flow of matter into, within, and out of systems, as chemical elements are recombined in different ways to form different products during cellular respiration.
- Students consider the idea that energy is not created or destroyed in the process of cellular respiration.