

MS-LS1-6 From Molecules to Organisms: Structures and Processes

California Science Test—Item Content Specifications

# MS-LS1-6 From Molecules to Organisms: Structures and Processes

Students who demonstrate understanding can:

Construct a scientific explanation based on evidence for the role of photosynthesis in the cycling of matter and flow of energy into and out of organisms.

[Clarification Statement: Emphasis is on tracing movement of matter and flow of energy.] [*Assessment Boundary: Assessment does not include the biochemical mechanisms of photosynthesis.*]

Continue to the next page for the Science and Engineering Practices, Disciplinary Core Ideas, and Crosscutting Concepts.

| Science and Engineering Practices | Disciplinary Core Ideas | Crosscutting Concepts |
| --- | --- | --- |
| Constructing Explanations and Designing Solutions  Constructing explanations and designing solutions in 6–8 builds on K–5 experiences and progresses to include constructing explanations and designing solutions supported by multiple sources of evidence consistent with scientific knowledge, principles, and theories.  Construct a scientific explanation based on valid and reliable evidence obtained from sources (including the students’ own experiments) 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.  Connections to Nature of Science  Scientific Knowledge is Based on Empirical Evidence  Science knowledge is based upon logical connections between evidence and explanations. | LS1.C: Organization for Matter and Energy Flow in Organisms  4. Plants, algae (including phytoplankton), and many microorganisms use the energy from light to make sugars (food) from carbon dioxide from the atmosphere and water through the process of photosynthesis, which also releases oxygen. These sugars can be used immediately or stored for growth or later use.  PS3.D: Energy in Chemical Processes and Everyday Life  3. The chemical reaction by which plants produce complex food molecules (sugars) requires an energy input (i.e., from sunlight) to occur. In this reaction, carbon dioxide and water combine to form carbon-based organic molecules and release oxygen. (*secondary to MS-LS1-6*) | Energy and Matter  Within a natural system, the transfer of energy drives the motion and/or cycling of matter. |

## Assessment Targets

Assessment targets describe the focal knowledge, skills, and abilities for a given three-dimensional Performance Expectation. Please refer to the Introduction for a complete description of assessment targets.

### Science and Engineering Subpractice(s)

Please refer to appendix A for a complete list of Science and Engineering Practices (SEP) subpractices. Note that the list in this section is not exhaustive.

6.1 Ability to construct explanations of phenomena

### Science and Engineering Subpractice Assessment Targets

Please refer to appendix A for a complete list of SEP subpractice assessment targets. Note that the list in this section is not exhaustive.

6.1.1 Ability to construct quantitative and/or qualitative explanations of observed relationships based on valid and reliable evidence

6.1.2 Ability to apply scientific concepts, principles, theories, and big ideas to construct an explanation of a real-world phenomenon

6.1.3 Ability to use models and representations in scientific explanation

### Disciplinary Core Idea Assessment Targets

#### LS1.C.4

* Identify organisms that depend on photosynthesis to survive
* Explain that the process of photosynthesis requires light energy from the Sun
* Explain that the sugars produced by photosynthesis can be used immediately or stored
* Explain that oxygen produced by photosynthesis is released and used by animals and plants in respiration
* Recognize that animals depend (directly or indirectly) on food from photosynthetic organisms for growth and survival

#### PS3.D.3

* Describe how photosynthesis uses energy to form carbon-based organic molecules (i.e., sugars) and oxygen from carbon dioxide and water

### Crosscutting Concept Assessment Target(s)

CCC5 Identify that within a natural or designed system, the transfer of energy drives the motion and/or cycling of matter

## Examples of Integration of Assessment Targets and Evidence

Note that the list in this section is not exhaustive.

Task provides data from an experiment on plant growth:

* Provides a description of the relationships between dependent variables and independent variables (6.1.1, LS1.C.4, and CCC5)

Task describes a real-world scenario of animals getting energy by eating photosynthetic organisms or other animals:

* Explains how the animals’ growth and survival depend (indirectly) on sunlight through the application of scientific concepts (e.g., energy flow in ecosystems) (6.1.2, LS1.C.4, and CCC5)

Task provides a model of how oxygen and carbon dioxide are cycled between plants and animals:

* Constructs an explanation of the phenomenon. (6.1.3, LS1.C.4, and CCC5)
* Explains the role of plants (or animals) in the cycling of matter (6.1.3, LS1.C.4, and CC5)
* Explains the path of oxygen and carbon dioxide in the cycling of matter (6.1.3, LS1.C.4, and CCC5)

Task describes a real-world scenario about the flow of energy in an ecosystem:

* Draws a model (or drags and drops components to create a model or selects one model from a number of choices) that represents the phenomenon (6.1.3, LS1.C.4, and CCC5)

## California Environmental Principles and Concepts

* EP2: The long-term functioning and health of terrestrial, freshwater, coastal, and marine ecosystems are influenced by their relationships with human societies.
* EP4: The exchange of matter between natural systems and human societies affects the long-term functioning of both.

## Possible Phenomena or Contexts

Note that the list in this section is not exhaustive.

* Photosynthetic organisms using carbon dioxide and water to make sugar and oxygen
* Animals depending on the oxygen released by photosynthetic organisms for respiration
* Photosynthetic organisms capturing energy from sunlight to make, use, and store sugars
* Some animals eating photosynthetic organisms for their stored energy and animals eating other animals, thus indirectly getting the energy stored by photosynthetic organisms

## Common Misconceptions

Note that the list in this section is not exhaustive.

* Plants take in all substances needed to grow through their roots.
* Plants get energy from the soil.
* Plants get their energy directly from sunlight instead of using the energy in sunlight to make, use, and store sugars.

## Additional Assessment Boundaries

None listed at this time.

## Additional References

MS-LS1-6 Evidence Statement [https://www.nextgenscience.org/sites/default/files/evidence\_statement/black\_white/MS-LS1-6 Evidence Statements June 2015 asterisks.pdf](https://www.nextgenscience.org/sites/default/files/evidence_statement/black_white/MS-LS1-6%20Evidence%20Statements%20June%202015%20asterisks.pdf)

California Environmental Principles and Concepts <http://californiaeei.org/abouteei/epc/>

California Education and the Environment Initiative <http://californiaeei.org/>

The *2016 Science Framework for California Public Schools Kindergarten through Grade 12*

Appendix 1: Progression of the Science and Engineering Practices, Disciplinary Core Ideas, and Crosscutting Concepts in Kindergarten through Grade 12 <https://www.cde.ca.gov/ci/sc/cf/documents/scifwappendix1.pdf>

Appendix 2: Connections to California Environmental Principles and Concepts <https://www.cde.ca.gov/ci/sc/cf/documents/scifwappendix2.pdf>

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