

HS-LS2-3 Ecosystems: Interactions, Energy, and Dynamics

 California Science Test—Item Content Specifications

HS-LS2-3 Ecosystems: Interactions, Energy, and Dynamics

Students who demonstrate understanding can:

Construct and revise an explanation based on evidence for the cycling of matter and flow of energy in aerobic and anaerobic conditions.

[Clarification Statement: Emphasis is on conceptual understanding of the role of aerobic and anaerobic respiration in different environments.] [*Assessment Boundary: Assessment does not include the specific chemical processes of either aerobic or anaerobic respiration.*]

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 SolutionsConstructing explanations and designing solutions in 9–12 builds on K–8 experiences and progresses to explanations and designs that are supported by multiple and independent student-generated sources of evidence consistent with scientific ideas, principles, and theories.Construct and revise an explanation based on valid and reliable evidence obtained from a variety of sources (including students’ own investigations, models, theories, simulations, and peer review) 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 ScienceScientific Knowledge is Open to Revision in Light of New EvidenceMost scientific knowledge is quite durable, but is, in principle, subject to change based on new evidence and/or reinterpretation of existing evidence. | LS2.B: Cycles of Matter and Energy Transfer in Ecosystems1. Photosynthesis and cellular respiration (including anaerobic processes) provide most of the energy for life processes.
 | Energy and MatterEnergy drives the cycling of matter within and between systems. |

## 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 explanations

### Disciplinary Core Idea Assessment Targets

#### LS2.B.3

* Identify and describe the evidence for the cycling of matter and flow of energy through organisms and ecosystems
* Distinguish between photosynthesis and respiration and the significance of each
* Distinguish between aerobic and anaerobic respiration and the significance of each
* Use a reasoning to describe the flow of energy through a food web

### Crosscutting Concept Assessment Target(s)

CCC5 Describe how energy drives the cycling of matter within and between systems

## Examples of Integration of Assessment Targets and Evidence

Note that the list in this section is not exhaustive.

Task provides a graph of CO2 levels varying seasonally in the Northern Hemisphere:

* Constructs an explanation for the varying levels of CO2 based on an understanding of rates of photosynthesis and respiration over different seasons (6.1.1, LS2.B.3, and CCC5)
* Describes how the evidence supports the explanation that the varying levels of CO2 are related to photosynthesis and respiration (6.1.1, LS2.B.3, and CCC5)

Task provides a graph of dissolved O2 levels varying hourly in an aquatic ecosystem (e.g., pond):

* Constructs an explanation for the varying levels of O2 based on an understanding of photosynthesis and respiration (6.1.2, LS2.B.3, and CCC5)
* Uses scientific concepts (e.g., energy), principles (e.g., matter conservation), theories (e.g., molecular theory), and big ideas (e.g., matter cycle and energy flow in ecosystems) to explain how the evidence supports a conclusion about the pattern in the graph (6.1.2, LS2.B.3, and CCC5)

Task provides data from a simulation measuring changes in dissolved CO2 or O2 in test tubes containing aquatic plants and/or aquatic animals kept in sealed test tubes in the light and in the dark:

* Makes a claim about the cycling of matter and/or energy flow within the model system (6.1.3, LS2.B.3, and CCC5)
* Justifies claim with evidence and reasoning (6.1.3, LS2.B.3, and CCC5)

Task provides students with a model of a terrestrial food web:

* Uses the model to explain the cycling of matter between organisms in the food web (6.1.3, LS2.B.3, and CCC5)
* Uses the model to describe the flow of energy through the food web (6.1.3, LS2.B.3, and CCC5)

## Possible Phenomena or Contexts

Note that the list in this section is not exhaustive.

* Flow of energy or cycling of matter in a food web
* Chemosynthesis vs. photosynthesis
* Anaerobic respiration in yeast
* Carbon cycle with aquatic plants in light vs. dark

## Common Misconceptions

Note that the list in this section is not exhaustive.

* Cellular respiration does not occur in plants.
* Cellular respiration is different in plants and animals.
* Energy cycles through a food web.

## Additional Assessment Boundaries

None listed at this time.

## Additional References

HS-LS2-3 Evidence Statement [https://www.nextgenscience.org/sites/default/files/evidence\_statement/black\_white/HS-LS2-3 Evidence Statements June 2015 asterisks.pdf](https://www.nextgenscience.org/sites/default/files/evidence_statement/black_white/HS-LS2-3%20Evidence%20Statements%20June%202015%20asterisks.pdf)

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>

Posted by the California Department of Education, March 2021 (updated February 2024)