

5-PS3-1 Energy

California Science Test—Item Content Specifications

# 5-PS3-1 Energy

Students who demonstrate understanding can:

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.]

| Science and Engineering Practices | Disciplinary Core Ideas | Crosscutting Concepts |
| --- | --- | --- |
| Developing and Using Models  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.  Use models to describe phenomena. | PS3.D: Energy in Chemical Processes and Everyday Life  2. 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).  LS1.C: Organization for Matter and Energy Flow in Organisms  2. 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. *(secondary to 5-PS3-1)* | Energy and Matter  Energy can be transferred in various ways and between objects. |

## 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.

2.2 Ability to use models

2.3 Ability to evaluate and revise models

### 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.

2.2.1 Ability to use models to identify concepts and relationships represented in the models

2.3.1 Ability to evaluate models, taking into account additional evidence or aspects of a phenomenon

2.3.2 Ability to revise models in light of empirical evidence to improve their explanatory and predictive power

### Disciplinary Core Idea Assessment Targets

#### PS3.D.2

* Identify sunlight as the original source of energy for all life on Earth
* Recognize that the storage of energy as plant matter is a chemical process involving air and water
* Recognize the role of producers and consumers (of various levels) in transforming energy of some form into energy more suited for transfer (e.g., producers transform Sun into plant matter and 1st-level consumers transform plant matter into animal proteins)

#### LS1.C.2

* Associate the energy to support animal life (bodily repair, growth, heat, and movement) with that derived from biomass
* Account for losses in energy from the Sun to trophic levels as being due to this energy use

### Crosscutting Concept Assessment Target(s)

CCC5 Identify the ways that energy is transferred between objects

## Examples of Integration of Assessment Targets and Evidence

Note that the list in this section is not exhaustive.

Task provides a model of energy transfer (a graph, picture, simulation, etc.) from the Sun to other organisms with sufficient evidence to support or refute a provided set of hypotheses:

* Determines if the model supports a hypothesis relating to energy needs with a single organism (2.2.1, LS1.C.2, and CCC5)
* Generates (or selects) sufficient reasoning for why the model supports or refutes a hypothesis relating to energy needs within a single organism (2.2.1, LS1.C.2, and CCC5)
* Identifies if the model supports a hypothesis relating to energy transfer between organisms (2.2.1, PS3.D.2, and CCC5)
* Generates (or selects) sufficient reasoning for why the model supports or refutes a hypothesis relating to energy transfer between organisms (2.2.1, PS3.D.2, and CCC5)

Task provides a model or simulation of energy transfer from the Sun to other organisms that features sufficient evidence in light of a particular question about energy transfer relationships among organisms and the Sun:

* Identifies the model components (including measurements, if needed) that are useful for answering a particular question about energy transfer relationships (2.2.1, PS3.D.2, and CCC5)

Task provides a set of models of energy transfer from the Sun to other organisms that provide various amounts of evidence that would be useful in reaching a conclusion about a question regarding energy transfer relationships:

* Identifies missing features of a model that limit its utility in answering the provided question (2.3.1, PS3.D.2, and CCC5)
* Selects the model which best helps reach a conclusion regarding the provided question (2.3.1, PS3.D.2, and CCC5)

Task provides a model of energy transfer from the Sun to other organisms that does not contain a sufficient amount of evidence to reach a conclusion about a provided hypothesis regarding energy usage needs:

* Identifies features of a model that are discrepant from the actual phenomenon (2.3.1, LS1.C.2, and CCC5)
* Provides appropriate reasoning for why a model does not show sufficient evidence to support a particular claim/explanation about energy transfer relationships (2.3.1, LS1.C.2, and CCC5)

Task provides a model that is in need of revision in order to be a better representation of energy transfer between organisms or energy needs within a single organism:

* Amends a model to include new components (i.e., new organisms, energy sources or sinks, or connections among them) in light of new information (2.3.2, PS3.D.2, LS1.C.2, and CCC5)
* Provides appropriate reasoning for revisions that focuses on how representing or quantifying energy (rather than temperature, emotion, or other irrelevant model components) helps to reach an explanatory or predictive goal (2.3.2, PS3.D.2, LS1.C.2, and CCC5)

## California Environmental Principles and Concepts

* EP1: The continuation and health of individual human lives and of human communities and societies depend on the health of the natural systems that provide essential goods and ecosystem services.
* EP2: The long-term functioning and health of terrestrial, freshwater, coastal, and marine ecosystems are influenced by their relationships with human societies.

## Possible Phenomena or Contexts

Note that the list in this section is not exhaustive.

* Production of plant matter via photosynthesis powered by sunlight
* Consumption of plant matter by consumers
* Use of energy from food to facilitate biologic processes (growth, maintenance of body temperature, movement, bodily repair, and cell replication)
* Need for consumption of additional food to get energy to facilitate increased biologic activity (e.g., need for more food after running a marathon)
* Need for consumption of additional food to get energy to respond to changing conditions (e.g., temperature)

## Common Misconceptions

Note that the list in this section is not exhaustive.

* Energy is not necessary for life functions.
* Life processes destroy energy.
* Plants obtain energy for growth from the soil (with assistance from decomposers) or human activity rather than from sunlight.
* Energy cannot be gained from eating dead animals, because dead things do not have energy.

## Additional Assessment Boundaries

None listed at this time.

## Additional References

5-PS3-1 Evidence Statement [https://www.nextgenscience.org/sites/default/files/evidence\_statement/black\_white/5-PS3-1 Evidence Statements June 2015 asterisks.pdf](https://www.nextgenscience.org/sites/default/files/evidence_statement/black_white/5-PS3-1%20Evidence%20Statements%20June%202015%20asterisks.pdf)

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

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