

4-PS3-2 Energy

California Science Test—Item Content Specifications

# 4-PS3-2 Energy

Students who demonstrate understanding can:

Make observations to provide evidence that energy can be transferred from place to place by sound, light, heat, and electric currents.

[*Assessment Boundary: Assessment does not include quantitative measurements of energy.*]

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 |
| --- | --- | --- |
| Planning and Carrying Out Investigations  Planning and carrying out investigations to answer questions or test solutions to problems in 3–5 builds on K–2 experiences and progresses to include investigations that control variables and provide evidence to support explanations or design solutions.  Make observations to produce data to serve as the basis for evidence for an explanation of a phenomenon or test a design solution. | PS3.A: Definitions of Energy   1. Energy can be moved from place to place by moving objects or through sound, light, or electric currents.   PS3.B: Conservation of Energy and Energy Transfer   1. Energy is present whenever there are moving objects, sound, light, or heat. When objects collide, energy can be transferred from one object to another, thereby changing their motion. In such collisions, some energy is typically also transferred to the surrounding air; as a result, the air gets heated and sound is produced. 2. Light also transfers energy from place to place. 3. Energy can also be transferred from place to place by electric currents, which can then be used locally to produce motion, sound, heat, or light. The currents may have been produced to begin with by transforming the energy of motion into electrical energy. | 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.

3.1 Ability to clarify the goal of the investigation and identify the evidence needed to address the purpose of the investigation

3.3 Ability to collect the data for the investigation

### 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.

3.1.1 Ability to describe the purpose of the investigation

3.1.2 Ability to identify relevant independent and dependent variables and to consider possible confounding variables or effects

3.1.3 Ability to describe what and how much data need to be collected to provide sufficient evidence for the purpose of the investigation

3.1.4 Ability to describe how the observations and/or collected data can be used as evidence for the phenomenon under investigation

3.3.1 Ability to use appropriate tools for accurate and precise measurements

### Disciplinary Core Idea Assessment Targets

#### PS3.A.2

* Recognize that motion, sound, light, and electric current are forms of energy

#### PS3.B.2

* Recognize that energy changes occur when objects collide but the total energy of the objects and the surroundings is conserved
* Describe that some energy is transferred from one object to another during a collision, resulting in a change in motion of the objects
* Describe that some energy is transferred from the objects during a collision to the surrounding air, resulting in sound and heat

#### PS3.B.3

* Recognize that light transfers energy from place to place

#### PS3.B.4

* Recognize that electric current transfers energy from place to place
* Describe that electrical energy can be transformed into motion, light, sound, and/or heat energy
* Describe that the energy of motion can be transformed into electrical energy

### 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 real-world problem that involves the transfer/transformation of energy and a list of materials and tools that may be used in an investigation:

* Identifies the transfer/transformations of energy under investigation (3.1.1, PS3.B.2, and CCC5)

Task provides a description of an investigation on the transfer/transformation of energy:

* Identifies factors that might affect the results of the investigation (3.1.2, PS3.B.2, and CCC5)
* Selects the method of data collection that will provide sufficient evidence to support the goal of the investigation (3.1.4, PS3.B.4, and CCC5)
* Identifies the data to collect and record to provide sufficient evidence to support the goal of the investigation (3.1.3, PS3.B.2, and CCC5)
* Identifies the independent and dependent variables in the investigation (3.1.2, PS3.B.3, and CCC5)

Task provides an investigation plan that includes the observations or data to be collected on the transfer or transformation of energy:

* Evaluates whether the collected data provides sufficient evidence to meet the goal of the investigation (3.1.4, PS3.B.3, and CCC5)
* Selects a rationale for why the plan supports the goal of the investigation (3.1.4, PS3.B.4, and CCC5)

Task provides an investigation plan and a list of unordered steps of data collection:

* Orders the steps to collect data for the investigation (3.3.1, PS3.B.4, and CCC5)

Task provides an investigation plan and a list of potential measuring tools or instruments:

* Selects the appropriate tools to collect data for the investigation (3.3.1, PS3.B.4, and CCC5)

## Possible Phenomena or Contexts

Note that the list in this section is not exhaustive.

* Transformations of energy involved during the operation of simple household appliances
* Transfer and transformations of energy using simple circuits
* Transfer of energy that occurs when two objects collide
* Transfer of thermal energy using a battery-powered light source

## Common Misconceptions

Note that the list in this section is not exhaustive.

* Energy is lost (not conserved) during transfers or transformations of energy (rather than transferred from the system to the surroundings).
* Energy transfer from one object or form to another is one hundred percent efficient.

## Additional Assessment Boundaries

None listed at this time.

## Additional References

[4-PS3-2 Evidence Statement](https://www.nextgenscience.org/sites/default/files/evidence_statement/black_white/4-PS3-2%20Evidence%20Statements%20June%202015%20asterisks.pdf) <https://www.nextgenscience.org/sites/default/files/evidence_statement/black_white/4-PS3-2%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>

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