

MS-PS3-5 Energy

California Science Test—Item Content Specifications

# MS-PS3-5 Energy

Students who demonstrate understanding can:

Construct, use, and present arguments to support the claim that when the kinetic energy of an object changes, energy is transferred to or from the object.

[Clarification Statement: Examples of empirical evidence used in arguments could include an inventory or other representation of the energy before and after the transfer in the form of temperature changes or motion of object.] [*Assessment Boundary: Assessment does not include calculations 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 |
| --- | --- | --- |
| Engaging in Argument from Evidence  Engaging in argument from evidence in 6–8 builds on K–5 experiences and progresses to constructing a convincing argument that supports or refutes claims for either explanations or solutions about the natural and designed worlds.  Construct, use, and present oral and written arguments supported by empirical evidence and scientific reasoning to support or refute an explanation or a model for a phenomenon.  Connections to Nature of Science  Scientific Knowledge is Based on Empirical Evidence  Science knowledge is based upon logical and conceptual connections between evidence and explanations | PS3.B: Conservation of Energy and Energy Transfer   1. When the motion energy of an object changes, there is inevitably some other change in energy at the same time. | Energy and Matter  Energy may take different forms (e.g. energy in fields, thermal energy, energy of motion). |

## 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.

7.1 Ability to construct scientific arguments

### 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.

7.1.1 Ability to identify evidence/data that supports a claim

7.1.2 Ability to develop scientific arguments that are supported by evidence/data

7.1.3 Ability to use reasoning to explain how relevant evidence/data supports or refutes the claim; the reasoning should reflect application of scientific concepts, principles, ideas, and models

### Disciplinary Core Idea Assessment Targets

#### PS3.B.5

* Describe that when the kinetic energy of an object changes, energy is transferred to or from that object
* Identify and describe evidence that supports the change in observable features (e.g., motion, temperature, sound) of an object before and after the interaction that changes the kinetic energy of the object
* Identify and describe evidence that supports the change in observable features of other objects or the surroundings in a defined system
* Evaluate evidence to support claims about the kinetic energy of an object and energy transferred to or from that object
* Use reasoning to connect evidence and construct an argument based on changes in the observable features of the object (e.g., motion, temperature) to explain that the kinetic energy of the object changed
* Use reasoning to connect evidence and construct an argument describing that when the kinetic energy of an object increases or decreases, the energy of other objects or the surroundings within the system increases or decreases, indicating that energy was transferred to or from the object

### Crosscutting Concept Assessment Target(s)

CCC5 Identify that energy may take different forms

## Examples of Integration of Assessment Targets and Evidence

Note that the list in this section is not exhaustive.

Task provides a video, simulation, or animation of a phenomenon where there is an energy input (e.g., a hand cranking a hand-crank flashlight) and an energy output (e.g., the light turning on and glowing):

* Constructs an argument claiming that energy was transferred within the system, supported with evidence of changes in energy from the video, simulation, or animation (7.1.1, PS3.B.5, and CCC5)
* Explains the energy changes from the beginning to the end of the video, simulation, or animation (7.1.3, PS3.B.5, and CCC5)

Task provides a claim about a phenomenon that includes unexplained evidence:

* Selects analysis statements that connect the evidence to the claim (7.1.1, PS3.B.5, and CCC5)

Task provides a claim that adding energy results in an increase in kinetic energy:

* Selects evidence statements that support the claim (7.1.2, PS3.B.5, and CCC5)

Task provides multiple arguments explaining how energy is transferred to or from an object based on a change in kinetic energy:

* Selects the best argument based on the evidence provided (7.1.2, PS3.B.5, and CCC5)

Task provides a claim about how energy is transferred to or from an object based on a change in kinetic energy:

* Selects the best evidence from a group of options and selects the appropriate crosscutting concept that best applies the evidence to the claim (7.1.3, PS3.B.5, and CCC5)

## Possible Phenomena or Contexts

Note that the list in this section is not exhaustive.

* Generating sound through physical movement
* Changing the velocity of an object with a physical force
* Changing the temperature of an object as a result of friction
* An object at rest at some height that is allowed to fall, changing the object’s kinetic energy
* Changing kinetic energy after an elastic collision

## Common Misconceptions

Note that the list in this section is not exhaustive.

* Objects at zero temperature (Celsius or Fahrenheit) have zero energy.
* Particles in solids or in freezing temperatures are not in motion.

## Additional Assessment Boundaries

None listed at this time.

## Additional References

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