

5-PS1-2 Matter and Its Interactions

California Science Test—Item Content Specifications

# 5-PS1-2 Matter and Its Interactions

Students who demonstrate understanding can:

Measure and graph quantities to provide evidence that regardless of the type of change that occurs when heating, cooling, or mixing substances, the total weight of matter is conserved.

[Clarification Statement: Examples of reactions or changes could include phase changes, dissolving, and mixing that form new substances.] [*Assessment Boundary: Assessment does not include distinguishing mass and weight.*]

| Science and Engineering Practices | Disciplinary Core Ideas | Crosscutting Concepts |
| --- | --- | --- |
| Using Mathematics and Computational Thinking  Mathematical and computational thinking in 3–5 builds on K–2 experiences and progresses to extending quantitative measurements to a variety of physical properties and using computation and mathematics to analyze data and compare alternative design solutions.  Measure and graph quantities such as weight to address scientific and engineering questions and problems. | PS1.A: Structure and Properties of Matter   1. The amount (weight) of matter is conserved when it changes form, even in transitions in which it seems to vanish.   PS1.B: Chemical Reactions   1. No matter what reaction or change in properties occurs, the total weight of the substances does not change. (Boundary: Mass and weight are not distinguished at this grade level.) | Scale, Proportion, and Quantity  Standard units are used to measure and describe physical quantities such as weight, time, temperature, and volume.  Connections to Nature of Science  Scientific Knowledge Assumes an Order and Consistency in Natural Systems  Science assumes consistent patterns in natural 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.

5.1 Ability to develop mathematical and/or computational models (e.g., graphical representation in a simulation)

5.2 Ability to conduct mathematical and/or computational analyses

### 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.

5.1.1 Ability to generate mathematical representations to describe characteristics and patterns of a scientific phenomenon and/or a design solution

5.1.2 Ability to use units of measurement, diagrams, and graphs to record and organize data gathered directly or provided from scientific investigations

5.2.2 Ability to use the results of computational models to identify the mathematical and/or computational representations that support a scientific explanation or a design solution

### Disciplinary Core Idea Assessment Targets

#### PS1.A.5

* Identify the standard units used to measure and describe physical quantities, such as mass/weight and volume
* Understand that solids, liquids, and gases are forms of matter and have mass/weight
* Describe that the amount of matter (mass/weight) is conserved during physical changes

#### PS1.B.3

* Describe that the amount of matter (mass/weight) is conserved during chemical changes

### Crosscutting Concept Assessment Target(s)

CCC3 Use standard units to measure and describe physical quantities such as weight, time, temperature, and volume

## Examples of Integration of Assessment Targets and Evidence

Note that the list in this section is not exhaustive.

Task provides a scenario involving a physical change or chemical change:

* Describes what quantities to measure and include in a graphical representation to illustrate the conservation of matter (5.1.1, PS1.A.5, PS1.B.3, and CCC3)

Task provides a scenario involving a physical change or chemical change and a graphical representation of the masses/weights of the substances before and after the change:

* Graphs the data to show that the total amount of matter was conserved during the change (5.1.2, PS1.A.5, PS1.B.3, and CCC3)
* Selects the graph that best represents the data and shows that matter was conserved during the change (5.1.2, PS1.A.5, PS1.B.3, and CCC3)
* Uses the graphical representations to describe or explain that matter was conserved (5.2.1, PS1.A.5, PS1.B.3, and CCC3)
* Uses the data, the principle of conservation of matter, and mathematical calculation to determine the amount of a substance consumed or produced during the change (5.2.1, PS1.A.5, PS1.B.3, and CCC3)

## Possible Phenomena or Contexts

Note that the list in this section is not exhaustive.

* Physical changes include phase changes and dissolving to form solutions.
* Chemical changes include precipitation reactions or simple reactions involving the consumption or production of a gas.
* Mathematical representations may include the weights of the substances before and after a change as well as the containers that hold the substances.

## Common Misconceptions

Note that the list in this section is not exhaustive.

* Solids are always heavier than liquids.
* Gases are weightless.
* An increase or decrease in weight during a physical or chemical change indicates that matter is not conserved.

## Additional Assessment Boundaries

None listed at this time.

## Additional References

5-PS1-2 Evidence Statement [https://www.nextgenscience.org/sites/default/files/evidence\_statement/black\_white/5-PS1-2 Evidence Statements June 2015 asterisks.pdf](https://www.nextgenscience.org/sites/default/files/evidence_statement/black_white/5-PS1-2%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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