

5-PS1-4 Matter and Its Interactions

California Science Test—Item Content Specifications

# 5-PS1-4 Matter and Its Interactions

Students who demonstrate understanding can:

Conduct an investigation to determine whether the mixing of two or more substances results in new substances.

[Clarification Statement: Examples of combinations that do not produce new substances could include sand and water. Examples of combinations that do produce new substances could include baking soda and vinegar or milk and vinegar.]

| 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.  Conduct an investigation collaboratively to produce data to serve as the basis for evidence, using fair tests in which variables are controlled and the number of trials considered. | PS1.B: Chemical Reactions   1. When two or more different substances are mixed, a new substance with different properties may be formed. | Cause and Effect  Cause and effect relationships are routinely identified and used to explain change. |

## 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.

3.2 Ability to develop, evaluate, and refine a plan 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.

3.2.1 Ability to decide how to observe and/or measure relevant variables, considering the level of accuracy and precision required and the kinds of instrumentation and techniques best suited to making such measurements

3.2.2 Ability to describe a detailed experimental procedure (e.g., number of trials, identify the control) and experimental setup

3.2.3 Ability to compare and evaluate alternative methods to determine which design provides the evidence necessary to address the purpose of the investigation

### Disciplinary Core Idea Assessment Targets

#### PS1.B.2

* Identify how a change in observed qualitative properties (e.g., state of matter, color, texture, and odor) of two substances after mixing may indicate that new substances may have formed
* Identify how a change in measured quantitative properties (e.g., mass/weight) of two substances after mixing may indicate that new substances may have formed
* Distinguish between physical and chemical changes

### Crosscutting Concept Assessment Target(s)

CCC2 Identify and test cause and effect relationships to explain change

## Examples of Integration of Assessment Targets and Evidence

Note that the list in this section is not exhaustive.

Task provides a context along with an incomplete list of measuring tools that may be used to determine whether the mixing of two or more substances results in new substances:

* Evaluates the list of measuring tools and identifies gaps in the list that are relevant to the purpose of the investigation (3.2.1, PS1.B.2, and CCC2)

Task provides a context along with a list of measuring tools that may or may not be useful for determining whether the mixing of two or more substances results in new substances:

* Selects the relevant measuring tools to provide the evidence necessary to address the purpose of the investigation (3.2.1, PS1.B.2, and CCC2)

Task provides a context and a list of relevant and irrelevant experimental procedures for determining whether the mixing of two or more substances results in new substances:

* Identifies the procedure that provides the evidence necessary to address the purpose of the investigation (3.2.2, PS1.B.2, and CCC2)

Task provides a context and a question related to whether the mixing of two or more substances results in new substances:

* Identifies the properties to observe or measure that would be useful to the investigation (3.2.2, PS1.B.2, and CCC2)

Task provides a context along with a list of variables that may be controlled in an investigation to determine whether the mixing of two or more substances results in new substances:

* Identifies the variable to manipulate, the variable to measure, and/or the variable(s) to control (3.2.2, PS1.B.2, and CCC2)

Task provides both flawed and acceptable experimental methods to determine whether the mixing of two or more substances results in new substances:

* Compares and evaluates the alternative methods to determine which design is appropriate to the investigation (3.2.3, PS1.B.2, and CCC2)

## Possible Phenomena or Contexts

Note that the list in this section is not exhaustive.

* Changes in color, physical state, or texture
* Changes in temperature of system or surroundings
* Formation of a precipitate or production of a gas
* Change in mass in an open system

## Common Misconceptions

Note that the list in this section is not exhaustive.

* Physical changes are irreversible.
* When matter dissolves or evaporates, it ceases to exist.
* Color changes always indicate a chemical change.
* All temperature changes that result from mixing substances indicate a chemical change.
* Two samples with similar physical properties (e.g., both are a gas) are likely the same substance.

## Additional Assessment Boundaries

None listed at this time.

## Additional References

5-PS1-4 Evidence Statement [https://www.nextgenscience.org/sites/default/files/evidence\_statement/black\_white/5-PS1-4 Evidence Statements June 2015 asterisks.pdf](https://www.nextgenscience.org/sites/default/files/evidence_statement/black_white/5-PS1-4%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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