# Physical Sciences—Grade Eight

# Alternate Item Content Specifications

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Table of Contents

MS-PS1-2 Matter and its Interactions 3

MS-PS1-6 Matter and its Interactions 5

MS-PS2-1 Motion and Stability: Forces and Interactions 7

MS-PS2-2 Motion and Stability: Forces and Interactions 9

MS-PS3-2 Energy 11

MS-PS3-3 Energy 13

MS-PS4-2 Waves and Their Applications in Technologies for Information Transfer 15

## MS-PS1-2 Matter and its Interactions

| California Science Connector | Focal Knowledge, Skills, and Abilities | Essential Understanding |
| --- | --- | --- |
| Using data provided through observation, identify evidence that proves a chemical reaction has taken place (e.g., change in color, gas is created, heat or light is given off or taken in). | 1. Ability to identify evidence that proves a chemical reaction has taken place. | Identify examples of change (e.g., color, temperature). |

CA NGSS Performance Expectation

Students who demonstrate understanding can:

**Analyze and interpret data on the properties of substances before and after the substances interact to determine if a chemical reaction has occurred.** [Clarification Statement: Examples of reactions could include burning sugar or steel wool, fat reacting with sodium hydroxide, and mixing zinc with hydrogen chloride.] *[Assessment Boundary*: *Assessment is limited to analysis of the following properties: density, melting point, boiling point, solubility, flammability, and odor.]*

Mastery Statements

Students will be able to:

* Identify a chemical change in matter
* Recognize that a chemical reaction has occurred
* Identify evidence that a chemical reaction occurred

Possible Phenomena or Contexts

*Note that the list in this section is not exhaustive or prescriptive.*

**Possible contexts include the following:**

* Common examples of burning materials
* Simple chemical reactions that cause copious amounts of bubbles to form
* Combinations of materials that cause the temperature of the resulting substance to change significantly, becoming either hotter or colder
* Combinations of materials that cause the resulting substance to have a completely different color

Additional Assessment Boundaries

* Do not refer to specific chemicals in items; use a general term, such as liquid or powder.

Additional References

California Science Test Item Specification for MS-PS1-2

<https://www.cde.ca.gov/ta/tg/ca/documents/itemspecs-ms-ps1-2.docx>

Environmental Principles and Concepts <http://californiaeei.org/abouteei/epc/>

The *2016 Science Framework for California Public Schools Kindergarten through Grade Twelve* <https://www.cde.ca.gov/ci/sc/cf/cascienceframework2016.asp>

Appendix 1: Progression of the Science and Engineering Practices, Disciplinary Core Ideas, and Crosscutting Concepts in Kindergarten through Grade Twelve

<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>

MS-PS1-6 Matter and its Interactions

| California Science Connector | Focal Knowledge, Skills, and Abilities | Essential Understanding |
| --- | --- | --- |
| Identify or modify a device in which a chemical process releases or absorbs thermal energy. | 1. Ability to identify or modify a device in which a chemical process releases thermal energy. 2. Ability to identify or modify a device in which a chemical process absorbs thermal energy. | Identify examples of chemical reactions that release energy (e.g., heat, light). |

CA NGSS Performance Expectation

Students who demonstrate understanding can:

**Undertake a design project to construct, test, and modify a device that either releases or absorbs thermal energy by chemical processes.** [Clarification Statement: Emphasis is on the design, controlling the transfer of energy to the environment, and modification of a device using factors such as type and concentration of a substance. Examples of designs could involve chemical reactions such as dissolving ammonium chloride or calcium chloride.] *[Assessment Boundary*: *Assessment is limited to the criteria of amount, time, and temperature of substance in testing the device.]*

Mastery Statements

Students will be able to:

* Identify an example of a chemical reaction that releases heat or light
* Identify a device that uses a chemical reaction to release thermal energy
* Identify a device that uses a chemical reaction to absorb thermal energy
* Identify a change in temperature as evidence that a device is releasing or absorbing thermal energy
* Identify how to change the amount of thermal energy a device releases or absorbs

Possible Phenomena or Contexts

*Note that the list in this section is not exhaustive or prescriptive.*

**Possible contexts include the following:**

* Burning common materials
* Combining common household materials such as hydrogen peroxide and yeast
* Instant cold/hot packs (dissolution of ammonium nitrate, magnesium sulfate, calcium chloride, etc.)
* Flameless ration heaters (used by the US military to heat meals, based on reaction between Mg metal and water)

Additional Assessment Boundaries

* Do not use names of chemicals or compounds.
* Refer to substances as a liquid or a powder (or appropriate term for state of matter).

Additional References

California Science Test Item Specification for MS-PS1-6

<https://www.cde.ca.gov/ta/tg/ca/documents/itemspecs-ms-ps1-6.docx>

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MS-PS2-1 Motion and Stability: Forces and Interactions

| California Science Connector | Focal Knowledge, Skills, and Abilities | Essential Understanding |
| --- | --- | --- |
| Through observation and demonstration, identify that when objects collide, the contact forces transfer energy and changes the objects’ motions. | 1. Recognize a solution to a problem involving the motion of two colliding objects. | Recognize the result of the implementation of a solution to the problem of two objects colliding. |

CA NGSS Performance Expectation

Students who demonstrate understanding can:

**Apply Newton’s Third Law to design a solution to a problem involving the motion of two colliding objects.** [Clarification Statement: Examples of practical problems could include the impact of collisions between two cars, between a car and stationary objects, and between a meteor and a space vehicle.] *[Assessment Boundary*: *Assessment is limited to vertical or horizontal interactions in one dimension.]*

Mastery Statements

Students will be able to:

* Identify how the movement of two objects will change when they collide
* Identify clothing or gear that minimizes the effect of a collision
* Identify common packaging that minimizes the effect of a collision
* Identify features of modes of transportation that minimize the effect of a collision
* Recognize how a solution to the problem of a collision was effective

Possible Phenomena or Contexts

*Note that the list in this section is not exhaustive or prescriptive.*

**Possible contexts include the following:**

* Crumple zones in car accidents
* Airbag deployment
* Protective gear and clothing such as helmets, knee and elbow pads, etc.
* Bubble wrap
* Foam egg cartons

Additional Assessment Boundaries

* None listed at this time

Additional References

California Science Test Item Specification for MS-PS2-1

<https://www.cde.ca.gov/ta/tg/ca/documents/itemspecs-ms-ps2-1.docx>

Environmental Principles and Concepts <http://californiaeei.org/abouteei/epc/>

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MS-PS2-2 Motion and Stability: Forces and Interactions

| California Science Connector | Focal Knowledge, Skills, and Abilities | Essential Understanding |
| --- | --- | --- |
| Recognize that a change in an object’s motion can be due to the mass of the object or the forces acting on the object by using data on the motion of the object. | 1. Ability to recognize that a change in an object’s motion can be due to the mass of the object by using data on the motion of the object. 2. Ability to recognize that a change in an object’s motion can be due to the forces acting on the object by using data on the motion of the object. | Recognize that a larger force causes a larger change in the motion of an object. |

CA NGSS Performance Expectation

Students who demonstrate understanding can:

**Plan an investigation to provide evidence that the change in an object’s motion depends on the sum of the forces on the object and the mass of the object.** [Clarification Statement: Emphasis is on balanced (Newton’s First Law) and unbalanced forces in a system, qualitative comparisons of forces, mass and changes in motion (Newton’s Second Law), frame of reference, and specification of units.] *[Assessment Boundary*: *Assessment is limited to forces and changes in motion in one-dimension in an inertial reference frame and to change in one variable at a time. Assessment does not include the use of trigonometry.]*

Mastery Statements

Students will be able to:

* Identify that a stronger push or pull results in a greater change in motion of an object
* Recognize that an object’s mass will affect the result of the force acting on the object
* Recognize the effect of a force on an object on how the motion of the object changes (speed or direction)
* Use a data table to analyze which object’s motion will be most affected by equal forces
* Use a data table to analyze which force will most effect the motion of objects of equal masses

Possible Phenomena or Contexts

*Note that the list in this section is not exhaustive or prescriptive.*

**Possible contexts include the following:**

* Cart launched into motion by a force (e.g., spring-loaded plunger)
* Cart-pulley-mass system on a ramp
* Balls or other toys that roll
* Wagons, trailers and other objects that can be pulled

Additional Assessment Boundaries

* None listed at this time

Additional References

California Science Test Item Specification for MS-PS2-2

<https://www.cde.ca.gov/ta/tg/ca/documents/itemspecs-ms-ps2-2.docx>

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MS-PS3-2 Energy

| California Science Connector | Focal Knowledge, Skills, and Abilities | Essential Understanding |
| --- | --- | --- |
| Describe how a change in distance changes the amount of potential energy stored in the system (e.g., carts at varying positions on a hill) by using models. | 1. Ability to describe how changing distance changes the amount of potential energy stored in the system (e.g., carts at varying positions on a hill) by using models. | Identify that the potential energy of an object changes when a force is changed (e.g., bringing an object up or down a hill). |

CA NGSS Performance Expectation

Students who demonstrate understanding can:

**Develop a model to describe that when the arrangement of objects interacting at a distance changes, different amounts of potential energy are stored in the system.** [Clarification Statement: Emphasis is on relative amounts of potential energy, not on calculations of potential energy. Examples of objects within systems interacting at varying distances could include: the Earth and either a roller coaster cart at varying positions on a hill or objects at varying heights on shelves, changing the direction/orientation of a magnet, and a balloon with static electrical charge being brought closer to a classmate’s hair. Examples of models could include representations, diagrams, pictures, and written descriptions of systems.] *[Assessment Boundary*: *Assessment is limited to two objects and electric, magnetic, and gravitational interactions.]*

Mastery Statements

Students will be able to:

* Identify which of two objects has more energy based on their position relative to the ground
* Identify whether the energy of an object increases or decreases when its position relative to the ground changes
* Identify the reason that the energy of an object changes when the position of the object changes relative to the ground

Possible Phenomena or Contexts

*Note that the list in this section is not exhaustive or prescriptive.*

**Possible contexts include the following:**

* Objects placed at different heights near Earth’s surface
* An object moving along a track at varying heights near Earth’s surface

Additional Assessment Boundaries

* None listed at this time

Additional References

California Science Test Item Specification for MS-PS3-2

<https://www.cde.ca.gov/ta/tg/ca/documents/itemspecs-ms-ps3-2.docx>

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MS-PS3-3 Energy

| California Science Connector | Focal Knowledge, Skills, and Abilities | Essential Understanding |
| --- | --- | --- |
| Use information (e.g., graph, model) to identify a device (e.g., foam cup, insulated box) that either minimizes or maximizes thermal energy transfer (e.g., keeping liquids hot or cold). | 1. Ability to use information to identify a device that minimizes thermal energy transfer. 2. Ability to use information to identify a device that maximizes thermal energy transfer. | Identify objects used to minimize or maximize thermal energy transfer (e.g., gloves). |

CA NGSS Performance Expectation

Students who demonstrate understanding can:

**Apply scientific principles to design, construct, and test a device that either minimizes or maximizes thermal energy transfer.** [Clarification Statement: Examples of devices could include an insulated box, a solar cooker, and a Styrofoam cup.] *[Assessment Boundary*: *Assessment does not include calculating the total amount of thermal energy transferred.]*

Mastery Statements

Students will be able to:

* Identify objects that keep substances cold
* Identify objects that keep substances warm
* Recognize which object will keep a substance cooler
* Recognize which object will keep a substance warmer
* Use data to compare which object will keep a substance cooler
* Use data to compare which object will keep a substance warmer

Environmental Principles and Concepts

Principle 4—The exchange of matter between natural systems and human societies affects the long-term functioning of both.

Possible Phenomena or Contexts

*Note that the list in this section is not exhaustive or prescriptive.*

**Possible contexts include the following:**

* House insulation methods
* Insulated cups and containers
* Cold-weather clothing
* Selecting a container when provided simple data about temperature change of the contents

Additional Assessment Boundaries

* None listed at this time

Additional References

California Science Test Item Specification for MS-PS3-3

<https://www.cde.ca.gov/ta/tg/ca/documents/itemspecs-ms-ps3-3.docx>

Environmental Principles and Concepts <http://californiaeei.org/abouteei/epc/>

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MS-PS4-2 Waves and Their Applications in Technologies for Information Transfer

| California Science Connector | Focal Knowledge, Skills, and Abilities | Essential Understanding |
| --- | --- | --- |
| Identify how light waves or sound waves are reflected, absorbed, or transmitted through various materials (e.g., water, air, glass) by using a model. | 1. Ability to identify how light waves are reflected, absorbed, or transmitted through various materials (e.g., water, air, glass) by using a model. 2. Ability to identify how sound waves are reflected, absorbed, or transmitted through various materials (e.g., water, air, glass) by using a model. | Recognize that light can have different brightness and color. |

CA NGSS Performance Expectation

Students who demonstrate understanding can:

**Develop and use a model to describe that waves are reflected, absorbed, or transmitted through various materials.** [Clarification Statement: Emphasis is on both light and mechanical waves. Examples of models could include drawings, simulations, and written descriptions.] *[Assessment Boundary*: *Assessment is limited to qualitative applications pertaining to light and mechanical waves.]*

Mastery Statements

Students will be able to:

* Recognize an example in which light is changing in intensity (getting brighter or dimmer)
* Recognize when light changes from one color to another
* Identify an example in which light is being reflected, absorbed, or transmitted
* Identify an example in which sound is being reflected, absorbed or transmitted
* Identify why a material reflects (material is shiny), absorbs (material is not clear), or transmits (material is clear) light

Possible Phenomena or Contexts

*Note that the list in this section is not exhaustive or prescriptive.*

**Possible contexts include the following:**

* Diagrams of sound or light waves being produced and then reflected, absorbed or transmitted based on everyday experiences such as mirrors, windows or windshields, walls, clothing, etc.

Additional Assessment Boundaries

* None listed at this time

Additional References

California Science Test Item Specification for MS-PS4-2

[https://www.cde.ca.gov/ta/tg/ca/documents/itemspecs-ms-ps4-2.docx](https://www.cde.ca.gov/ta/tg/ca/documents/itemspecs-3-ls4-2.docx)

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