

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

California Science Test—Item Content Specifications

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

Students who demonstrate understanding can:

Develop a model to describe that light reflecting from objects and entering the eye allows objects to be seen.

[*Assessment Boundary: Assessment does not include knowledge of specific colors reflected and seen, the cellular mechanisms of vision, or how the retina works.*]

| Science and Engineering Practices | Disciplinary Core Ideas | Crosscutting Concepts |
| --- | --- | --- |
| Developing and Using Models  Modeling in 3–5 builds on K–2 experiences and progresses to building and revising simple models and using models to represent events and design solutions.  Develop a model to describe phenomena. | PS4.B: Electromagnetic Radiation  3. An object can be seen when light reflected from its surface enters the eyes. | Cause and Effect  Cause and effect relationships are routinely identified. |

## 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.

2.1 Ability to develop models

2.2 Ability to use models

### 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.

2.1.1 Ability to determine components of a scientific event, system, or design solution

2.1.2 Ability to determine the relationships among multiple components of a scientific event, system, or design solution

2.2.1 Ability to use models to identify concepts and relationships represented in the models

2.2.2 Ability to use models to generate explanations and predictions about a scientific phenomenon

### Disciplinary Core Idea Assessment Targets

#### PS4.B.3

* Describe that the visibility of an object that does not produce its own light depends on the presence of a light source
* Describe that light travels in straight lines (represented by rays) until it is reflected/absorbed (or bent)
* Describe that the visualization of an object involves the reflection of light from a source off the surface of an object and into the eye

### Crosscutting Concept Assessment Target(s)

CCC2 Identify cause and effect relationships

## Examples of Integration of Assessment Targets and Evidence

Note that the list in this section is not exhaustive.

Task provides both a description of a phenomenon that involves the relationship between light reflection and the visibility of objects and a list of relevant and irrelevant components to include in a model:

* Selects the components to develop a model that illustrates/explains the phenomenon (2.1.1, PS4.B.3, and CCC2)

Task provides both a description of a phenomenon that involves the relationship between light reflection and the visibility of objects and a list of relevant and irrelevant components (e.g., possible paths of lights represented by rays) to complete a model:

* Selects the components needed to complete a model that illustrates/explains the phenomenon (2.1.1, PS4.B.3, and CCC2)

Task provides both a description of a phenomenon that involves the relationship between light reflection and the visibility of objects and a list of models to illustrate/explain a behavior about the phenomenon (e.g., light travels in straight lines):

* Selects the model that illustrates/explains the behavior (2.1.1, PS4.B.3, and CCC2)

Task provides both a physical model of a phenomenon that involves the relationship between light reflection and the visibility of objects and observations/evidence from the model:

* Identifies the relationships in the model based on the observations/evidence (e.g., an object is more difficult to see when the light source is dimmer) (2.2.1, PS4.B.3, and CCC2)

Task provides a model of a phenomenon that involves the relationship between light reflection and the visibility of objects:

* Uses the model to make a prediction about the phenomenon (2.2.2, PS4.B.3, and CCC2)
* Uses the model to construct an explanation about phenomenon (2.2.2, PS4.B.3, and CCC2)

## Possible Phenomena or Contexts

Note that the list in this section is not exhaustive.

* An object that cannot be observed without light reflecting off of its surface
* Shadows produced by partially blocking a light source
* A translucent or opaque barrier between an object and an eye
* A mirror used to alter the path of light to view an object
* Light reflecting off a partially illuminated Moon

## Common Misconceptions

Note that the list in this section is not exhaustive.

* Eyes produce light.
* Only shiny objects reflect light.

## Additional Assessment Boundaries

None listed at this time.

## Additional References

4-PS4-2 Evidence Statement [https://www.nextgenscience.org/sites/default/files/evidence\_statement/black\_white/4-PS4-2 Evidence Statements June 2015 asterisks.pdf](https://www.nextgenscience.org/sites/default/files/evidence_statement/black_white/4-PS4-2%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) <https://www.cde.ca.gov/ci/sc/cf/documents/scifwappendix1.pdf>

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