

MS-ESS1-1 Earth's Place in the Universe

California Science Test—Item Content Specifications

# MS-ESS1-1 Earth's Place in the Universe

Students who demonstrate understanding can:

Develop and use a model of the Earth-sun-moon system to describe the cyclic patterns of lunar phases, eclipses of the sun and moon, and seasons.

[Clarification Statement: Examples of models can be physical, graphical, or conceptual.]

| Science and Engineering Practices | Disciplinary Core Ideas | Crosscutting Concepts |
| --- | --- | --- |
| Developing and Using ModelsModeling in 6–8 builds on K–5 experiences and progresses to developing, using, and revising models to describe, test, and predict more abstract phenomena and design systems.Develop and use a model to describe phenomena. | ESS1.A: The Universe and Its Stars1. Patterns of the apparent motion of the sun, the moon, and stars in the sky can be observed, described, predicted, and explained with models.

ESS1.B: Earth and the Solar SystemThis model of the solar system can explain eclipses of the sun and the moon. Earth’s spin axis is fixed in direction over the short-term but tilted relative to its orbit around the sun. The seasons are a result of that tilt and are caused by the differential intensity of sunlight on different areas of Earth across the year. | PatternsPatterns can be used to identify cause-and-effect relationships.Connections to Nature of ScienceScientific Knowledge Assumes an Order and Consistency in Natural SystemsScience assumes that objects and events in natural systems occur in consistent patterns that are understandable through measurement and observation. |

## 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

2.3 Ability to evaluate and revise 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

2.3.2 Ability to revise models in light of empirical evidence to improve their explanatory and predictive power

### Disciplinary Core Idea Assessment Targets

#### ESS1.A.3

* Model the arcing paths of the Sun, Moon, and stars through the night’s sky in relation to Earth’s axis

#### ESS1.B.4

* Describe the spatial and temporal relationships among the Earth-Moon-Sun system
* Identify the Sun as the original source of light/energy that illuminates the Moon and warms Earth
* Model the path of light from a source as a line directed towards another object and the behaviors of light (e.g., reflection)
* Explain lunar phases in terms of the relative positions of the Sun, Earth, and Moon
* Describe how the Moon’s equal rotational and orbital speeds results in the inability to see the far side of the Moon from Earth
* Ability to identify and describe the role of the tilt in the Moon’s orbital plane with respect to Earth’s orbit around the Sun in terms of the frequency and type of lunar and solar eclipses
* Identify and describe the role of Earth’s axial tilt in causing seasons despite minimal change in the proximity to the Sun
* Contrast sunlight received by the northern and southern hemispheres leading to opposite experiences of winter/summer

### Crosscutting Concept Assessment Target(s)

CCC1 Use patterns to 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 a phenomenon related to the Earth-Moon-Sun system and a list of relevant and irrelevant components, labels, or other representations for a model:

* Identifies appropriate components needed to develop a model to explain the phenomenon (2.1.1, ESS1.B.4, and CCC1)

Task provides an incomplete or incorrect model of a phenomenon related to the Earth-Moon-Sun system and a list of relevant and irrelevant components, labels, or other representations:

* Identifies the components, labels, or representation to complete the model to explain the phenomena (2.1.1, ESS1.B.4, and CCC1)

Task provides evidence generated from a model representing a phenomenon related to the Earth-Moon-Sun system and a driving question or hypothesis:

* Evidence generated from the model to answer the question or support/refute the hypothesis (2.2.1, ESS1.B.4, and CCC1)

Task provides a model representing a phenomenon related to the Earth-Moon-Sun system:

* Identifies the relationships between components of the model based on the evidence (2.2.1, ESS1.B.4, and CCC1)

Task provides a model and a phenomenon related to the Earth-Moon-Sun system:

* Identifies the explanation that the model is trying to convey (2.2.2, ESS1.B.4, and CCC1)
* Identifies the predictive meaning of the model (2.2.2, ESS1.B.4, and CCC1)
* Uses the model to make a prediction (2.2.2, ESS1.B.4, and CCC1)
* Manipulates the model to correctly depict an explanation of the observed phenomenon (2.2.2, ESS1.B.4, and CCC1)

Task provides a model with a limitation in representing a phenomenon related to the Earth-Moon-Sun system:

* Identifies a revision that improves the model’s explanatory or predictive power (2.3.2, ESS1.B.4, and CCC1)
* Identifies the rationale for revising the model (2.3.2, ESS1.B.4, and CCC1)

## Possible Phenomena or Contexts

Note that the list in this section is not exhaustive.

* The seasonal changes observed in the patterns of movement of the Moon, Sun, and other objects in the sky (e.g., change in hours of daylight, change in visible constellations)
* Changes that model the amount of the Moon’s surface that is illuminated over the lunar cycle based on the positions of the Sun, Moon, and Earth relative to one another
* Models used to compare the rates of rotation and revolution of the Moon and Earth
* The relationships between Earth’s tilt on its axis of rotation and seasonal changes
* Comparison of the frequency of eclipses of the Sun and Moon to the frequency of full Moons and new Moons

## Common Misconceptions

Note that the list in this section is not exhaustive.

* The “dark side” (or far side) of the Moon does not receive light from the Sun.
* All objects within the solar system orbit on the same plane.
* The distance between Earth and the Sun is the primary cause of seasons.

## Additional Assessment Boundaries

None listed at this time.

## Additional References

MS-ESS1-1 Evidence Statement [https://www.nextgenscience.org/sites/default/files/evidence\_statement/black\_white/MS-ESS1-1 Evidence Statements June 2015 asterisks.pdf](https://www.nextgenscience.org/sites/default/files/evidence_statement/black_white/MS-ESS1-1%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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