

MS-ESS1-4 Earth's Place in the Universe

California Science Test—Item Content Specifications

# MS-ESS1-4 Earth's Place in the Universe

Students who demonstrate understanding can:

Construct a scientific explanation based on evidence from rock strata for how the geologic time scale is used to organize Earth's 4.6-billion-year-old history.

[Clarification Statement: Emphasis is on how analyses of rock formations and the fossils they contain are used to establish relative ages of major events in Earth’s history. Examples of Earth’s major events could range from being very recent (such as the last Ice Age or the earliest fossils of homo sapiens) to very old (such as the formation of Earth or the earliest evidence of life). Examples can include the formation of mountain chains and ocean basins, the evolution or extinction of particular living organisms, or significant volcanic eruptions.] [*Assessment Boundary: Assessment does not include recalling the names of specific periods or epochs and events within them.*]

Continue to the next page for the Science and Engineering Practices, Disciplinary Core Ideas, and Crosscutting Concepts.

| Science and Engineering Practices | Disciplinary Core Ideas | Crosscutting Concepts |
| --- | --- | --- |
| Constructing Explanations and Designing SolutionsConstructing explanations and designing solutions in 6–8 builds on K–5 experiences and progresses to include constructing explanations and designing solutions supported by multiple sources of evidence consistent with scientific ideas, principles, and theories.Construct a scientific explanation based on valid and reliable evidence obtained from sources (including the students’ own experiments) and the assumption that theories and laws that describe the natural world operate today as they did in the past and will continue to do so in the future. | ESS1.C: The History of Planet Earth1. The geologic time scale interpreted from rock strata provides a way to organize Earth’s history. Analyses of rock strata and the fossil record provide only relative dates, not an absolute scale.
 | Scale, Proportion, and QuantityTime, space, and energy phenomena can be observed at various scales using models to study systems that are too large or too small. |

## 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.

6.1 Ability to construct explanations of phenomena

### 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.

6.1.1 Ability to construct quantitative and/or qualitative explanations of observed relationships based on valid and reliable evidence

6.1.2 Ability to apply scientific concepts, principles, theories, and big ideas to construct an explanation of a real-world phenomenon

6.1.3 Ability to use models and representations in scientific explanations

### Disciplinary Core Idea Assessment Targets

#### ESS1.C.4

* Articulate how events in the approximately 4.6-billion-year history of Earth are organized relative to each other on geologic timescales
* Use evidence and reasoning to describe how relative ordering is determined using rock strata, layering, major geologic events, and the fossil record
* Identify and describe geologic evidence such as types and order of rock strata, the fossil record, and major geologic events
* Use multiple, valid sources of evidence, which could include experiments, to construct an explanation about the historical events on Earth
* Use scientific reasoning to connect evidence to an explanation of the timeline of Earth’s history

### Crosscutting Concept Assessment Target(s)

CCC3 Observe time, space, and energy phenomena at various scales using models to study systems that are too large or too small for direct observation

## Examples of Integration of Assessment Targets and Evidence

Note that the list in this section is not exhaustive.

Task provides geologic evidence of Earth’s history (e.g., rock strata or the fossil record):

* Makes a correct conclusion regarding the relationships between the geologic evidence and the geologic time scale (6.1.1, ESS1.C.4, and CCC3)
* Describes how the evidence allows for the distinction between causal and correlational relationships (6.1.1, ESS1.C.4, and CCC3)
* Uses scientific concepts, principles, theories, and big ideas to explain how the evidence supports a conclusion about Earth’s history (6.1.2, ESS1.C.4, and CCC3)

Task provides a model or diagram showing how a major geologic event such as a volcano or asteroid impact is recorded in rock strata or the fossil record:

* Uses scientific concepts, principles, theories, and big ideas based on the model or diagram to construct an explanation of a phenomenon (6.1.3, ESS1.C.4, and CCC3)

## Possible Phenomena or Contexts

Note that the list in this section is not exhaustive.

* Rock layers may contain information about the environment when the rock formed, such as relative age when compared to other layers.
* Mass extinctions of organisms have occurred and are evident in the geologic record.
* Cross sections of rock strata can be interpreted using fossils, faults, and other evidence.
* Comparisons of the age and history of rock layers at different locations can be made using widespread and recognizable events, such as volcanic eruptions, earthquakes, tsunamis, and meteorite impacts.
* Correlations between fossil evidence in similar rock layers at different locations can be used to describe changes through geologic time.

## Common Misconceptions

Note that the list in this section is not exhaustive.

* Earth is relatively young.
* Earth has not changed much over time.
* There is very little evidence that Earth has changed over time.
* Faults occur only in older rock layers.
* Fossils in different rock layers are the remains of organisms that existed at the same time.
* Index fossils can provide the exact dates of rock strata formation.
* The materials that make up a rock layer are the same age as the rock layer itself.
* Rocks and rock strata do not change after they are initially formed.

## Additional Assessment Boundaries

None listed at this time.

## Additional References

MS-ESS1-4 Evidence Statement [https://www.nextgenscience.org/sites/default/files/evidence\_statement/black\_white/MS-ESS1-4 Evidence Statements June 2015 asterisks.pdf](https://www.nextgenscience.org/sites/default/files/evidence_statement/black_white/MS-ESS1-4%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) <https://www.cde.ca.gov/ci/sc/cf/documents/scifwappendix1.pdf>

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