

MS-LS4-1 Biological Evolution: Unity and Diversity

California Science Test—Item Content Specifications

# MS-LS4-1 Biological Evolution: Unity and Diversity

Students who demonstrate understanding can:

Analyze and interpret data for patterns in the fossil record that document the existence, diversity, extinction, and change of life forms throughout the history of life on Earth under the assumption that natural laws operate today as in the past.

[Clarification Statement: Emphasis is on finding patterns of changes in the level of complexity of anatomical structures in organisms and the chronological order of fossil appearance in the rock layers.] [*Assessment Boundary: Assessment does not include the names of individual species or geological eras in the fossil record.*]

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 |
| --- | --- | --- |
| Analyzing and Interpreting Data  Analyzing data in 6–8 builds on K–5 experiences and progresses to extending quantitative analysis to investigations, distinguishing between correlation and causation, and basic statistical techniques of data and error analysis.  Analyze and interpret data to determine similarities and differences in findings.  Connections to Nature of Science  Scientific Knowledge is Based on Empirical Evidence  Science knowledge is based upon logical and conceptual connections between evidence and explanations. | LS4.A: Evidence of Common Ancestry and Diversity  3. The collection of fossils and their placement in chronological order (e.g., through the location of the sedimentary layers in which they are found or through radioactive dating) is known as the fossil record. It documents the existence, diversity, extinction, and change of many life forms throughout the history of life on Earth. | Patterns  Graphs, charts, and images can be used to identify patterns in data.  Connections to Nature of Science  Scientific Knowledge Assumes an Order and Consistency in Natural Systems  Science 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.

4.2 Ability to analyze data to identify relationships

### 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.

4.2.1 Ability to use empirical data to describe patterns and relationships

4.2.2 Ability to identify patterns (qualitative or quantitative) among variables represented in data

### Disciplinary Core Idea Assessment Targets

#### LS4.A.3

* Identify patterns between sedimentary rock layers and the relative age of rock layers
* Identify time periods when a given fossil organism is present
* Identify periods of time when changes in the absence or presence of many fossil organisms can be observed
* Identify patterns of change in the level of complexity of anatomical structures in the fossil record over time
* Analyze and interpret the data in fossils for the existence, diversity, extinction, and change in life forms throughout the history of Earth
* Recognize observed patterns in the fossil record as evidence for when mass extinctions occurred
* Recognize observed patterns in the fossil record as evidence for when organisms emerged, evolved, or went extinct
* Recognize observed patterns in the fossil record as evidence for increasing diversity and complexity of organisms on Earth

### Crosscutting Concept Assessment Target(s)

CCC1 Use graphs, charts, and images to identify patterns in data

## Examples of Integration of Assessment Targets and Evidence

Note that the list in this section is not exhaustive.

Task provides a data and/or graphical display of the fossil record:

* Describes patterns as evidence of existence, extinction, diversity, and/or change in life forms in the fossil record (4.2.1, LS4.A.3, and CCC1)

Task describes an example(s) of existence, extinction, diversity, and/or change in life forms over time:

* Identifies a data representation (e.g., chart, table, or graph) about the fossil record that is consistent with the description and provides evidence to support a claim (4.2.2, LS4.A.3, and CCC1)
* Identifies a graphic of the fossil record that is consistent with the description and provides evidence to support a claim (4.2.2, LS4.A.3, and CCC1)

## California Environmental Principles and Concepts

* EP2: The long-term functioning and health of terrestrial, freshwater, coastal, and marine ecosystems are influenced by their relationships with human societies.

## Possible Phenomena or Contexts

Note that the list in this section is not exhaustive.

* The geographic distribution of species
* Changes in the size and function of anatomical structures over time
* Evidence of mass extinctions
* Evidence for the emergence and extinction of species
* Use of vertical location in strata to determine relative ages of different fossils

## Common Misconceptions

Note that the list in this section is not exhaustive.

* Extinction is rare.
* Extinction occurs at a steady rate throughout Earth’s history.
* Most of the species that lived in the past are still alive today.
* Anatomical change occurs quickly.
* There has always been great diversity and complexity of life on Earth.

## Additional Assessment Boundaries

None listed at this time.

## Additional References

MS-LS4-1 Evidence Statement [https://www.nextgenscience.org/sites/default/files/evidence\_statement/black\_white/MS-LS4-1 Evidence Statements June 2015 asterisks.pdf](https://www.nextgenscience.org/sites/default/files/evidence_statement/black_white/MS-LS4-1%20Evidence%20Statements%20June%202015%20asterisks.pdf)

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

California Education and the Environment Initiative <http://californiaeei.org/>

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>

Appendix 2: Connections to California Environmental Principles and Concepts <https://www.cde.ca.gov/ci/sc/cf/documents/scifwappendix2.pdf>

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