

MS-LS4-4 Biological Evolution: Unity and Diversity

California Science Test—Item Content Specifications

# MS-LS4-4 Biological Evolution: Unity and Diversity

Students who demonstrate understanding can:

Construct an explanation based on evidence that describes how genetic variations of traits in a population increase some individuals’ probability of surviving and reproducing in a specific environment.

[Clarification Statement: Emphasis is on using simple probability statements and proportional reasoning to construct explanations.]

| Science and Engineering Practices | Disciplinary Core Ideas | Crosscutting Concepts |
| --- | --- | --- |
| Constructing Explanations and Designing Solutions  Constructing 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 an explanation that includes qualitative or quantitative relationships between variables that describe phenomena. | LS4.B: Natural Selection  3. Natural selection leads to the predominance of certain traits in a population, and the suppression of others. | Cause and Effect  Phenomena may have more than one cause, and some cause and effect relationships in systems can only be described using probability. |

## 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

#### LS4.B.3

* Identify and describe the evidence that individuals in a species are not identical and genetic variations are inherited
* Identify and describe the evidence to support that some individuals are better suited to survive and reproduce in a specific environment
* Identify and describe cause-and-effect relationships between traits and the probability of survival and reproduction of a given organism in a specific environment
* Describe natural selection in that the proportion of individuals with the best suited traits for the environment will be more likely to survive and reproduce; therefore, the given traits will increase in frequency over many generations
* Describe natural selection in that the proportion of individuals with disadvantageous traits for the environment will be less likely to survive and reproduce; therefore, the given traits will decrease over many generations

### Crosscutting Concept Assessment Target(s)

CCC2 Identify that phenomena may have more than one cause, and some cause and effect relationships in systems can only be described using probability

## Examples of Integration of Assessment Targets and Evidence

Note that the list in this section is not exhaustive.

Task provides a scenario showing two or more variations of a trait within a given population in response to environmental change:

* Explains why one variation of the trait is more advantageous given the environmental change (6.1.1, LS4.B.3, and CCC2)

Task provides data on changing frequencies of multiple variations of a trait within a given population in response to environmental change:

* Describes how the increasing frequency of one variation over other variations is evidence for how the variation is more advantageous for the specific environmental change (6.1.2, LS4.B.3, and CCC2)
* Describes how the frequencies of given traits within a population are evidence for natural selection (6.1.2, LS4.B.3, and CCC2)

Task provides a graphical example of change in a species over time:

* Explains the change in the species using appropriate scientific concepts (6.1.2, LS4.B.3, and CCC2)

Task provides a simulation representing changing phenotypes within a given population in response to environmental change:

* Explains how the environmental change resulted in the different frequencies of traits (6.1.3, LS4.B.3, and CCC2)
* Predicts a likely change in frequency of the phenotypes in the population (6.1.3, LS4.B.3, and CCC2)

## Possible Phenomena or Contexts

Note that the list in this section is not exhaustive.

* Environmental changes over time
* Changes in available resources
* Introduction/removal of a species
* Changes from increased gene flow with other populations
* Effects of habitat change due to human activity

## Common Misconceptions

Note that the list in this section is not exhaustive.

* Individual organisms can change their features to suit the environment.
* All individuals of the same species have the same features.
* Natural selection occurs within an organism’s lifetime.
* All organisms in a population are able to adapt to environmental changes and survive.

## Additional Assessment Boundaries

None listed at this time.

## Additional References

MS-LS4-4 Evidence Statement [https://www.nextgenscience.org/sites/default/files/evidence\_statement/black\_white/MS-LS4-4 Evidence Statements June 2015 asterisks.pdf](https://www.nextgenscience.org/sites/default/files/evidence_statement/black_white/MS-LS4-4%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>

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