# Life Sciences—Grade Eight

# Alternate Item Content Specifications

**Prepared for the California Department of Education by Educational Testing Service**



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##

## MS-LS1-1 From Molecules to Organisms: Structures and Processes

| California Science Connector | Focal Knowledge, Skills, and Abilities | Essential Understanding |
| --- | --- | --- |
| Identify that living things are made of one cell or many and different types of cells.  | 1. Ability to identify a representation of a living thing that is made of one cell.
2. Ability to identify a representation of a living thing that is made of different types of cells.
 | Distinguish between living and nonliving things.  |

### CA NGSS Performance Expectation

Students who demonstrate understanding can:

**Conduct an investigation to provide evidence that living things are made of cells; either one cell or many different numbers and types of cells.** [Clarification Statement: Emphasis is on developing evidence that living things **(\*\*including Bacteria, Archaea, and Eukarya)** are made of cells, distinguishing between living and non-living things, and understanding that living things may be made of one cell or many and varied cells. **\*\*Viruses, while not cells, have features that are both common with, and distinct from, cellular life.**]

### Mastery Statements

Students will be able to:

* Identify examples of living and nonliving things
* Differentiate multicellular organisms from nonliving things
* Differentiate unicellular organisms from multicellular organisms

### Possible Phenomena or Contexts

*Note that the list in this section is not exhaustive or prescriptive.*

**Possible contexts include the following:**

* Living organisms that are too small to be seen with the naked eye
* Models representing living organisms made of one cell compared to nonliving things
* Models representing multicellular living organisms compared to nonliving things
* Common living things that are made up of many cells, such as animals

### Additional Assessment Boundaries

* Cell structures should not be labeled.

### Additional References

California Science Test Item Specification for MS-LS1-1

<https://www.cde.ca.gov/ta/tg/ca/documents/itemspecs-ms-ls1-1.docx>

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

The *2016 Science Framework for California Public Schools Kindergarten through Grade Twelve* <https://www.cde.ca.gov/ci/sc/cf/cascienceframework2016.asp>

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<https://www.cde.ca.gov/ci/sc/cf/documents/scifwappendix2.pdf>

## MS-LS1-2 From Molecules to Organisms: Structures and Processes

| California Science Connector | Focal Knowledge, Skills, and Abilities | Essential Understanding |
| --- | --- | --- |
| Identify the function of a cell as a whole and the function of a cell wall or cell membrane by using a model of a cell. | 1. Ability to identify the function of a cell as a whole by using a model of a cell.
2. Ability to identify the function of a cell wall by using a model of a cell.
3. Ability to identify the function of a cell membrane by using a model of a cell.
 | Identify a model of a cell. |

### CA NGSS Performance Expectation

Students who demonstrate understanding can:

**Develop and use a model to describe the function of a cell as a whole and ways parts of cells contribute to the function.** [Clarification Statement: Emphasis is on the cell functioning as a whole system and the primary role of identified parts of the cell, specifically the nucleus, chloroplasts, mitochondria, cell membrane, and cell wall.] *[Assessment Boundary: Assessment of organelle structure/function relationships is limited to the cell wall and cell membrane. Assessment of the function of the other organelles is limited to their relationship to the whole cell. Assessment does not include the biochemical function of cells or cell parts.]*

### Mastery Statements

Students will be able to:

* Identify a model of a cell
* Recognize that cells are the building blocks for all parts of multicellular organisms
* Identify the functions of the cell wall
* Identify the functions of the cell membrane
* Recognize that an individual cell in multicellular organisms cannot carry out its functions alone
* Identify that plants and animals are made of cells

### Possible Phenomena or Contexts

*Note that the list in this section is not exhaustive or prescriptive.*

**Possible contexts include the following:**

* Simple drawings of different types of cells
* Drawings of objects with a shape like that of a cell, but that are clearly not a cell
* Drawings of tissues with more than one kind of cell
* Structures and functions of plant and animal cells
* Cell walls of plants (not unicellular organisms)

### Additional Assessment Boundaries

* None listed at this time

### Additional References

California Science Test Item Specification for MS-LS1-2

<https://www.cde.ca.gov/ta/tg/ca/documents/itemspecs-ms-ls1-2.docx>

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

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## MS-LS1-7 From Molecules to Organisms: Structures and Processes

| California Science Connector | Focal Knowledge, Skills, and Abilities | Essential Understanding |
| --- | --- | --- |
| Identify the outcome of the process of breaking down food molecules (e.g., sugar) as the release of energy, which can be used to support other processes within the organism. | 1. Ability to identify the outcome of the process of breaking down food molecules (e.g., sugar) as the release of energy
2. Identify ways in which energy from food can be used to support other processes within the organism.
 | Recognize that food taken in by an organism is broken down and used by an organism for growth. |

### CA NGSS Performance Expectation

Students who demonstrate understanding can:

**Develop a model to describe how food is rearranged through chemical reactions forming new molecules that support growth and/or release energy as this matter moves through an organism.** [Clarification Statement: Emphasis is on describing that molecules are broken apart and put back together and that in this process, energy is released.] *[Assessment Boundary*: *Assessment does not include details of the chemical reactions for photosynthesis or respiration.]*

### Mastery Statements

Students will be able to:

* Recognize an example that shows that humans and animals need food to grow
* Recognize that humans and animals need food for energy
* Identify examples of life processes that require energy from food
* Recognize that energy from food is used for life processes such as circulation and respiration
* Identify a simple example of the process by which food is broken down and then energy is distributed throughout the body
* Identify two life processes that require energy from food

### Possible Phenomena or Contexts

*Note that the list in this section is not exhaustive or prescriptive.*

**Possible contexts include the following:**

* Growth of people and animals from infancy to adulthood
* Simple process of consumption, digestion, and energy production

### Additional Assessment Boundaries

* None listed at this time

### Additional References

California Science Test Item Specification for MS-LS1-7

<https://www.cde.ca.gov/ta/tg/ca/documents/itemspecs-ms-ls1-7.docx>

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## MS-LS1-8 From Molecules to Organisms: Structures and Processes

| California Science Connector | Focal Knowledge, Skills, and Abilities | Essential Understanding |
| --- | --- | --- |
| Identify examples of how sensory information sent to the brain is used immediately for behavior or stored as a memory. | 1. Ability to identify an example of how sensory information is used immediately for behavior.
2. Ability to identify an example of how sensory information sent to brain is stored as a memory.
 | Identify that the brain and behavioral responses are part of a system that allows animals to survive (e.g., how the appearance of food generates behavioral responses like salivation or hunger, how the smell of particular foods can bring up past memories associated with that smell). |

### CA NGSS Performance Expectation

Students who demonstrate understanding can:

**Gather and synthesize information that sensory receptors respond to stimuli by sending messages to the brain for immediate behavior or storage as memories.** *[Assessment Boundary*: *Assessment Boundary: Assessment does not include mechanisms for the transmission of this information.]*

### Mastery Statements

Students will be able to:

* Identify examples in which the response of animals to sensory information helps the animals survive
* Identify a sensory input that will trigger a specific behavior in a human or an animal
* Identify a specific behavior in a human or animal that will result from a sensory input
* Identify a memory that will result from a sensory input
* Identify the pathway by which a sensory input results in an action
* Identify the pathway by which a sensory input results in a memory

### Possible Phenomena or Contexts

*Note that the list in this section is not exhaustive or prescriptive.*

**Possible contexts include the following:**

* Pleasant flavors
* Pleasant scents
* Enjoyable activities
* Stimuli that cause reflexive behavior

### Additional Assessment Boundaries

* None listed at this time

### Additional References

California Science Test Item Specification for MS-LS1-8

<https://www.cde.ca.gov/ta/tg/ca/documents/itemspecs-ms-ls1-8.docx>

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## MS-LS2-1 Ecosystems: Interactions, Energy, and Dynamics

| California Science Connector | Focal Knowledge, Skills, and Abilities | Essential Understanding |
| --- | --- | --- |
| Identify factors in a graph (including resources, climate or competition) in an ecosystem that influence growth in populations of organisms. | 1. Ability to identify resources in an ecosystem that influence growth in populations of organisms.
2. Ability to identify climate in an ecosystem that influences growth in populations of organisms.
3. Ability to identify competition in an ecosystem that influences growth in populations of organisms.
 | Match organisms to their habitats. |

### CA NGSS Performance Expectation

Students who demonstrate understanding can:

**Analyze and interpret data to provide evidence for the effects of resource availability on organisms and populations of organisms in an ecosystem.** [Clarification Statement: Emphasis is on cause and effect relationships between resources and growth of individual organisms and the numbers of organisms in ecosystems during periods of abundant and scarce resources.]

### Mastery Statements

Students will be able to:

* Recognize the appropriate habitat for a plant or animal based on structures of the plant or animal
* Match a resource to the plants or animals that require the resource to survive
* Match temperature or rainfall values to plants or animals that require a specific range of temperature or rainfall to survive
* Use provided information to identify plants or animals that compete for the same resource
* Identify a change in a resource when provided information in a table or graph
* Identify the effect of a change in a resource on a population of plants or animals
* Identify a change in climate when provided information in a table or graph
* Identify the effect of a change in climate on a population of plants or animals
* Identify a change in the competition between a population of plants or animals when provided information in a table or graph
* Identify the effect of a change in competition on a population of plants or animals

### Environmental Principles and Concepts

Principle 2—The long-term functioning and health of terrestrial, freshwater, coastal and marine ecosystems are influenced by their relationships with human societies.

Principle 3—Natural systems proceed through cycles that humans depend upon, benefit from, and can alter.

### Possible Phenomena or Contexts

*Note that the list in this section is not exhaustive or prescriptive.*

**Possible contexts include the following:**

* Habitats with highly limited resources that are easy to see and describe
* Habitats that require very obvious adaptations for survival
* Seasonal changes to resource availability
* Introduction of a new species to existing community
* An environmental change that alters resource availability
* Increased competition

### Additional Assessment Boundaries

* None listed at this time

### Additional References

California Science Test Item Specification for MS-LS2-1

<https://www.cde.ca.gov/ta/tg/ca/documents/itemspecs-ms-ls2-1.docx>

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##

## MS-LS2-2 Ecosystems: Interactions, Energy, and Dynamics

| California Science Connector | Focal Knowledge, Skills, and Abilities | Essential Understanding |
| --- | --- | --- |
| Describe examples of competitive, predatory, or symbiotic relationships by using models of interactions between organisms in an ecosystem. | 1. Ability to identify a competitive relationship by using a model of interactions between organisms in an ecosystem.
2. Ability to identify a predatory relationship by using a model of interactions between organisms in an ecosystem.
3. Ability to identify a symbiotic relationship by using a model of interactions between organisms in an ecosystem.
 | Identify that animals compete for food. |

### CA NGSS Performance Expectation

Students who demonstrate understanding can:

**Construct an explanation that predicts patterns of interactions among organisms across multiple ecosystems.** [Clarification Statement: Emphasis is on predicting consistent patterns of interactions in different ecosystems in terms of the relationships among and between organisms and abiotic components of ecosystems. Examples of types of interactions could include competitive, predatory, and mutually beneficial.]

### Mastery Statements

Students will be able to:

* Identify that animals compete for food
* Recognize that organisms compete for resources in an ecosystem
* Recognize that organisms may have a predatory relationship in an ecosystem
* Recognize that organisms may have a symbiotic relationship in an ecosystem
* Identify organisms that have a predatory or symbiotic relationship
* Identify the predator and prey in a predatory relationship

### Possible Phenomena or Contexts

*Note that the list in this section is not exhaustive or prescriptive.*

**Possible contexts include the following:**

* Relationship between two animals that eat the same kind of plant
* Relationship between one animal that eats another animal
* Relationship in which two organisms help each other

### Additional Assessment Boundaries

* None listed at this time

### Additional References

California Science Test Item Specification for MS-LS2-2

<https://www.cde.ca.gov/ta/tg/ca/documents/itemspecs-ms-ls2-2.docx>

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## MS-LS2-3 Ecosystems: Interactions, Energy, and Dynamics

| California Science Connector | Focal Knowledge, Skills, and Abilities | Essential Understanding |
| --- | --- | --- |
| Using a model, identify energy transfer between producers, consumers, and decomposers in an ecosystem. | 1. Ability to identify energy transfer between producers, consumers and decomposers in an ecosystem by using a model (e.g., producers get energy from sunlight, producers provide energy for consumers and decomposers recycle nutrients and matter in the ecosystem).
 | Recognize that when people or animals eat plants they are taking energy into their bodies. |

### CA NGSS Performance Expectation

Students who demonstrate understanding can:

**Develop a model to describe the cycling of matter and flow of energy among living and nonliving parts of an ecosystem.** [Clarification Statement: Emphasis is on describing the conservation of matter and flow of energy into and out of various ecosystems, and on defining the boundaries of the system.] *[Assessment Boundary*: *Assessment does not include the use of chemical reactions to describe the processes.]*

### Mastery Statements

Students will be able to:

* Use food chain models to identify the transfer of energy from the Sun to producers to consumers
* Use an energy pyramid model to identify the transfer of energy from producers to consumers
* Use a model to identify the transfer of energy between living and nonliving parts of the ecosystem, including primary and secondary consumers

### Environmental Principles and Concepts

Principle 1—The continuation and health of individual human lives and of human communities and societies depend on the health of the natural systems that provide essential goods and ecosystem services.

Principle 2—The long-term functioning and health of terrestrial, freshwater, coastal, and marine ecosystems are influenced by their relationships with human societies.

Principle 3—Natural systems proceed through cycles that humans depend upon, benefit from, and can alter.

Principle 4—The exchange of matter between natural systems and human societies affects the long-term functioning of both.

Principle 5—Decisions affecting resources and natural systems are based on a wide range of considerations and decision-making processes.

### Possible Phenomena or Contexts

*Note that the list in this section is not exhaustive or prescriptive.*

**Possible contexts include the following:**

* Food chains
* Food webs
* Pyramid of energy

### Additional Assessment Boundaries

* None listed at this time

### Additional References

California Science Test Item Specification for MS-LS2-3

<https://www.cde.ca.gov/ta/tg/ca/documents/itemspecs-ms-ls2-3.docx>

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

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##

## MS-LS2-4 Ecosystems: Interactions, Energy, and Dynamics

| California Science Connector | Focal Knowledge, Skills, and Abilities | Essential Understanding |
| --- | --- | --- |
| Identify the outcome using evidence of changes in physical or biological components of an ecosystem to populations of organisms in that ecosystem. | 1. Ability to identify the outcome of changes in physical or biological components of an ecosystem to populations of organisms in that ecosystem. (e.g., some organisms survive and reproduce, some move to new locations, some move into the transformed environment, some die).
 | Recognize effects of changes in an ecosystem on an organism  |

### CA NGSS Performance Expectation

Students who demonstrate understanding can:

**Construct an argument supported by empirical evidence that changes to physical or biological components of an ecosystem affect populations.** [Clarification Statement: Emphasis is on recognizing patterns in data and making warranted inferences about changes in populations, and on evaluating empirical evidence supporting arguments about changes to ecosystems.]

### Mastery Statements

Students will be able to:

* Identify whether a change in an ecosystem helps an individual organism survive or makes it more difficult for the organism to survive
* Identify a specific effect of a physical or biological change in an ecosystem on a population of organisms
* Use information presented in a graph or data table to identify changes in physical or biological conditions and identify the effect on a population of organism
* Use information presented in a graph or data table to identify changes in physical or biological conditions and identify the effect on a population of organism and why the effect occurred

### Environmental Principles and Concepts

Principle 1—The continuation and health of individual human lives and of human communities and societies depend on the health of the natural systems that provide essential goods and ecosystem services.

Principle 2—The long-term functioning and health of terrestrial, freshwater, coastal, and marine ecosystems are influenced by their relationships with human societies.

Principle 3—Natural systems proceed through cycles that humans depend upon, benefit from, and can alter.

Principle 4—The exchange of matter between natural systems and human societies affects the long-term functioning of both.

Principle 5—Decisions affecting resources and natural systems are based on a wide range of considerations and decision-making processes.

### Possible Phenomena or Contexts

*Note that the list in this section is not exhaustive or prescriptive.*

**Possible contexts include the following:**

* Effect on plants if there is less sunlight
* Effect on plants or animals if there is a long-term change in the temperature
* Effect on plants or animals if there is a significant change in the amount of annual rainfall
* Effect on plants or animals if water becomes polluted
* Effect on plants or animals from human-caused changes to the landscape (dams, homes, farming, etc.)
* Effects on animals if the food or water they need becomes unavailable
* Effects on plants or animals if a competitor is introduced or increases in number

### Additional Assessment Boundaries

* None listed at this time

### Additional References

California Science Test Item Specification for MS-LS2-4

<https://www.cde.ca.gov/ta/tg/ca/documents/itemspecs-ms-ls2-4.docx>

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

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##

## MS-LS3-2 Heredity: Inheritance and Variation of Traits

| California Science Connector | Focal Knowledge, Skills, and Abilities | Essential Understanding |
| --- | --- | --- |
| Use a model, through observation, to identify that a variety of inherited traits passed from parents to offspring lead to differences in offspring (e.g., eye color, fur pattern, plant height). | 1. Ability to identify that a variety of inherited traits passed from parents to offspring lead to differences in offspring (e.g., eye color, fur pattern, plant height).
 | Identify similarities and differences between animal or plant parents and their offspring. |

### CA NGSS Performance Expectation

Students who demonstrate understanding can:

**Develop and use a model to describe why asexual reproduction results in offspring with identical genetic information and sexual reproduction results in offspring with genetic variation.** [Clarification Statement: Emphasis is on using models such as Punnett squares, diagrams, and simulations to describe the cause and effect relationship of gene transmission from parent(s) to offspring and resulting genetic variation.]

### Mastery Statements

Students will be able to:

* Identify a trait that is similar when comparing a parent and offspring plant or animal
* Identify a trait that is different when comparing a parent and offspring plant or animal
* When shown the two parents of a plant or animal, identify the parent that contributed a specific trait to an offspring plant or animal
* When shown the two parents of a plant or animal, identify which parents contributed specific traits to two or more plant or animal offspring

### Possible Phenomena or Contexts

*Note that the list in this section is not exhaustive or prescriptive.*

**Possible contexts include the following:**

* Animal traits such as ear shape, fur color, fur length, characteristics of tails, etc.
* Plant traits such as flower color, seed color and texture, height, etc.

### Additional Assessment Boundaries

* None listed at this time

### Additional References

California Science Test Item Specification for MS-LS3-2

<https://www.cde.ca.gov/ta/tg/ca/documents/itemspecs-ms-ls3-2.docx>

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

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## MS-LS4-6 Biological Evolution: Unity and Diversity

| California Science Connector | Focal Knowledge, Skills, and Abilities | Essential Understanding |
| --- | --- | --- |
| Use numerical data sets or graphical representations through observation that represent a proportional relationship between some change in the environment and corresponding changes in a population’s genetic variation over time. | 1. Ability to use numerical data sets or graphical representations that show a proportional relationship between a change in the environment and a corresponding change in genetic variation over time to identify the genetic change that is related to the environmental change.
 | Recognize that characteristics that allow an individual to survive lead to changes in genetic traits in populations over time. |

### CA NGSS Performance Expectation

Students who demonstrate understanding can:

**Use mathematical representations to support explanations of how natural selection may lead to increases and decreases of specific traits in populations over time.** [Clarification Statement: Emphasis is on using mathematical models, probability statements, and proportional reasoning to support explanations of trends in changes to populations over time.] *[Assessment Boundary*: *Assessment does not include Hardy Weinberg calculations.]*

### Mastery Statements

Students will be able to:

* Identify the organism most likely to survive in a changed environment based on the traits of the organism and the characteristics of the new environment
* Identify a change in a population of organisms that would make them more likely to survive in a changed environment
* Use data in tables or graphs to match a change in an environment to a change in the traits of a population that would make them more likely to survive in the changed environment

### Environmental Principles and Concepts

Principle 2—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 or prescriptive.*

**Possible contexts include the following:**

* Changes in food sources
* Changes in environmental conditions
* Changes in competition with other species for resources
* Presence of different traits in the population

### Additional Assessment Boundaries

* None listed at this time

### Additional References

California Science Test Item Specification for MS-LS4-6

<https://www.cde.ca.gov/ta/tg/ca/documents/itemspecs-ms-ls4-6.docx>

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