

4-LS1-1 From Molecules to Organisms: Structures and Processes

Students who demonstrate understanding can:

- 4-LS1-1. Construct an argument that plants and animals have internal and external structures that function to support survival, growth, behavior, and reproduction.** [Clarification Statement: Examples of structures could include thorns, stems, roots, colored petals, heart, stomach, lung, brain, and skin.] [Assessment Boundary: Assessment is limited to macroscopic structures within plant and animal systems.]

The performance expectation above was developed using the following elements from the NRC document *A Framework for K-12 Science Education*:

Science and Engineering Practices

Engaging in Argument from Evidence

Engaging in argument from evidence in 3–5 builds on K–2 experiences and progresses to critiquing the scientific explanations or solutions proposed by peers by citing relevant evidence about the natural and designed world(s).

- Construct an argument with evidence, data, and/or a model.

Disciplinary Core Ideas

LS1.A: Structure and Function

- Plants and animals have both internal and external structures that serve various functions in growth, survival, behavior, and reproduction.

Crosscutting Concepts

Systems and System Models

- A system can be described in terms of its components and their interactions.

Observable features of the student performance by the end of the grade:

1	Supported claims
a	Students make a claim to be supported about a phenomenon. In the claim, students include the idea that plants and animals have internal and external structures that function together as part of a system to support survival, growth, behavior, and reproduction.
2	Identifying scientific evidence
a	Students describe* the given evidence, including: <ol style="list-style-type: none"> The internal and external structures of selected plants and animals. The primary functions of those structures
3	Evaluating and critiquing evidence
a	Students determine the strengths and weaknesses of the evidence, including whether the evidence is relevant and sufficient to support a claim about the role of internal and external structures of plants and animals in supporting survival, growth, behavior, and/or reproduction.
4	Reasoning and synthesis
a	Students use reasoning to connect the relevant and appropriate evidence and construct an argument that includes the idea that plants and animals have structures that, together, support survival, growth, behavior, and/or reproduction. Students describe* a chain of reasoning that includes: <ol style="list-style-type: none"> Internal and external structures serve specific functions within plants and animals (e.g., the heart pumps blood to the body, thorns discourage predators). The functions of internal and external structures can support survival, growth, behavior, and/or reproduction in plants and animals (e.g., the heart pumps blood throughout the body, which allows the entire body access to oxygen and nutrients; thorns prevent predation, which allows the plant to grow and reproduce). Different structures work together as part of a system to support survival, growth, behavior, and/or reproduction (e.g., the heart works with the lungs to carry oxygenated blood throughout the system; thorns protect the plant, allowing reproduction via stamens and pollen to occur).

4-LS1-2 From Molecules to Organisms: Structures and Processes

Students who demonstrate understanding can:

- 4-LS1-2. Use a model to describe that animals receive different types of information through their senses, process the information in their brain, and respond to the information in different ways.** [Clarification Statement: Emphasis is on systems of information transfer.] [Assessment Boundary: Assessment does not include the mechanisms by which the brain stores and recalls information or the mechanisms of how sensory receptors function.]

The performance expectation above was developed using the following elements from the NRC document *A Framework for K-12 Science Education*:

Science and Engineering Practices

Developing and Using Models

Modeling in 3–5 builds on K–2 experiences and progresses to building and revising simple models and using models to represent events and design solutions.

- Use a model to test interactions concerning the functioning of a natural system.

Disciplinary Core Ideas

LS1.D: Information Processing

- Different sense receptors are specialized for particular kinds of information, which may be then processed by the animal's brain. Animals are able to use their perceptions and memories to guide their actions.

Crosscutting Concepts

Systems and System Models

- A system can be described in terms of its components and their interactions.

Observable features of the student performance by the end of the grade:

1	Components of the model	
	a	From a given model, students identify and describe* the relevant components for testing interactions concerning the functioning of a given natural system, including:
		i. Different types of information about the surroundings (e.g., sound, light, odor, temperature).
		ii. Sense receptors able to detect different types of information from the environment.
		iii. Brain.
iv. Animals' actions.		
2	Relationships	
	a	Students describe* the relationships between components in the model, including:
		i. Different types of sense receptors detect specific types of information within the environment.
		ii. Sense receptors send information about the surroundings to the brain.
		iii. Information that is transmitted to the brain by sense receptors can be processed immediately as perception of the environment and/or stored as memories.
iv. Immediate perceptions or memories processed by the brain influence an animal's action or responses to features in the environment.		
3	Connections	
	a	Students use the model to describe* that:
		i. Information in the environment interacts with animal behavioral output via interactions mediated by the brain.
		ii. Different types of sensory information are relayed to the brain via different sensory receptors, allowing experiences to be perceived, stored as memories, and influence behavior (e.g., an animal sees a brown, rotten fruit and smells a bad odor — this sensory information allows the animal to use information about other fruits that appear to be rotting to make decisions about what to eat; an animal sees a red fruit and a green fruit — after eating them both, the animal learns that the red fruit is sweet and the green fruit is bitter and then uses this sensory information, perceived and stored as memories, to guide fruit selection next time).
	iii. Sensory input, the brain, and behavioral output are all parts of a system that allow animals to engage in appropriate behaviors.	
	b	Students use the model to test interactions involving sensory perception and its influence on animal behavior within a natural system, including interactions between:
i. Information in the environment.		

	ii. Different types of sense receptors.
	iii. Perception and memory of sensory information.
	iv. Animal behavior.