

## 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: <ol style="list-style-type: none"> <li>Different types of information about the surroundings (e.g., sound, light, odor, temperature).</li> <li>Sense receptors able to detect different types of information from the environment.</li> <li>Brain.</li> <li>Animals' actions.</li> </ol>
2	Relationships
a	Students describe* the relationships between components in the model, including: <ol style="list-style-type: none"> <li>Different types of sense receptors detect specific types of information within the environment.</li> <li>Sense receptors send information about the surroundings to the brain.</li> <li>Information that is transmitted to the brain by sense receptors can be processed immediately as perception of the environment and/or stored as memories.</li> <li>Immediate perceptions or memories processed by the brain influence an animal's action or responses to features in the environment.</li> </ol>
3	Connections
a	Students use the model to describe* that: <ol style="list-style-type: none"> <li>Information in the environment interacts with animal behavioral output via interactions mediated by the brain.</li> <li>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).</li> <li>Sensory input, the brain, and behavioral output are all parts of a system that allow animals to engage in appropriate behaviors.</li> </ol>
b	Students use the model to test interactions involving sensory perception and its influence on animal behavior within a natural system, including interactions between: <ol style="list-style-type: none"> <li>Information in the environment.</li> </ol>

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