

Systems in Motion

Trace how organization levels and organ systems work together.

HS-LS1-2 "Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms..."

NAME _____

DATE _____

1 READ AND MARK _____ Read it twice

YOUR JOB In the passage, write C, T, O, or S beside each named example of a cell, tissue, organ, or organ system. Circle each sentence that explains an interaction between systems, so you can trace how levels and systems work together.

A Deer Responds

- ① Scientists use models to show how a multicellular organism is organized. A model may use boxes, labels, and arrows to connect levels. Specialized cells with similar jobs form tissues. Different tissues combine to build an organ, and organs that work together form an organ system. The organ systems interact to keep the whole organism alive. In a deer, smooth muscle cells and elastic connective tissue help form the wall of an artery. The artery is an organ in the circulatory system. This hierarchy matters because a change at one level can affect the function of the larger system.
- ② When a deer stands up quickly, its nervous system detects the change and sends signals to muscles in its legs. Skeletal muscles contract, pulling on bones and moving the deer. At the same time, the circulatory system must deliver blood to active leg tissues. Artery walls contain smooth muscle and elastic connective tissue. These tissues help arteries adjust their diameter and handle changing pressure, which helps regulate blood flow. The movement response therefore depends on interacting systems: the nervous system provides signals, the muscular and skeletal systems produce movement, and the circulatory system supports working tissues.
- ③ Interactions also support nutrient uptake and water delivery. After a deer eats leaves, the digestive system breaks food into nutrients that can be absorbed through the small intestine into the blood. The circulatory system then carries these nutrients to body tissues. Water absorbed from the digestive tract also enters the blood and is delivered throughout the body. A useful model does more than list parts. It shows directions of movement and explains each connection. For example, arrows can show nutrients moving from the small intestine to blood, then from blood to body tissues. The model should make clear that the digestive and circulatory systems depend on one another.

2 ANSWER WITH EVIDENCE _____ Use the passage

- 1** Using the deer artery example, place these structures in order from smallest to largest: artery, circulatory system, smooth muscle cells, elastic connective tissue.

- 2** What path should arrows show in a model of nutrient delivery after the deer eats leaves?

- 3** When the deer stands quickly, explain the roles of the nervous system, the muscular and skeletal systems, and the circulatory system.

- 4** How do smooth muscle and elastic connective tissue in an artery wall support a circulatory-system function?

3 YOUR TURN _____ Your own words

Create a labeled box-and-arrow model for a person beginning to run after hearing a whistle. Include a cell, tissue, organ, and organ system for both the nervous and muscular systems, label what happens along the arrows, and add one sentence explaining how the systems interact to produce movement.

PART 1 • READ AND MARK

In the passage, write C, T, O, or S beside each named example of a cell, tissue, organ, or organ system. Circle each sentence that explains an interaction between systems, so you can trace how levels and systems work together. Accept any marking that follows this job and points at the right text.

PART 2 • ANSWERS

#	QUESTION	ANSWER
1	Using the deer artery example, place these structures in order from smallest to largest: artery, circulatory system, smooth muscle cells, elastic connective tissue.	Smooth muscle cells, elastic connective tissue, artery, circulatory system.
2	What path should arrows show in a model of nutrient delivery after the deer eats leaves?	Nutrients move from the small intestine into the blood, then from the blood to body tissues.
3	When the deer stands quickly, explain the roles of the nervous system, the muscular and skeletal systems, and the circulatory system.	The nervous system sends signals, the muscular and skeletal systems move the deer as muscles pull bones, and the circulatory system delivers blood to active leg tissues.
4	How do smooth muscle and elastic connective tissue in an artery wall support a circulatory-system function?	They help arteries adjust diameter and handle changing pressure, which helps regulate blood flow.

PART 3 • YOUR TURN (SAMPLE ANSWER)

Neuron [cell] --is part of--> nervous tissue --is part of--> brain [organ] --is part of--> nervous system Nervous system --sends signal to--> skeletal muscle cell --is part of--> skeletal muscle tissue --is part of--> quadriceps muscle [organ] --is part of--> muscular system --pulls--> leg bones --produces--> running The nervous system sends a signal that causes quadriceps muscles to pull leg bones, beginning the run.

Accept models that accurately show the hierarchy from cell to tissue to organ to organ system and connect the nervous and muscular systems through a labeled signal and movement pathway. Equivalent accurate organs, muscles, and nervous-system structures are acceptable.