Signal Routes

Build a model of nervous system structure and function.

HS-AP5-1 "Develop a model that illustrates the structural components and functional subdivisions of the nervous system."

NAME _____ DATE _____

1 READ AND MARK

Read it twice

YOUR JOB Circle the physical parts of the nervous system, underline its named divisions and subdivisions, and number the steps from detecting the horn to stepping back.

A Horn at the Crosswalk

1. At a crosswalk, Maya hears a car horn and steps away from the curb. Her nervous system links a sound outside her body to a movement that protects her. A useful model has two layers: where signals travel and what jobs those signals perform. The central nervous system, or CNS, consists of the brain and spinal cord. The peripheral nervous system, or PNS, consists of nerves outside the brain and spinal cord. These nerves connect the CNS with receptors, muscles, and organs. A model showing only the brain would miss the routes that carry information between the body and its control center.

2. Sound receptors in Maya's ears detect the horn. In the PNS, the sensory division carries information from those receptors toward the CNS. Her brain interprets the sound and decides to move. Signals that direct her legs travel from the brain through the spinal cord. The motor division of the PNS carries commands away from the CNS. Its somatic branch sends commands to skeletal muscles, allowing Maya to step back. In a model, an arrow from ear receptors to the CNS shows incoming information. An arrow from the CNS to leg muscles shows an outgoing command.

3. At the same moment, Maya's heart beats faster. The autonomic branch of the motor division regulates organs without requiring a conscious command to each organ. Its sympathetic subdivision helps prepare her body for urgent action, including a faster heartbeat. After the car has passed and she feels safe, its parasympathetic subdivision helps slow her heartbeat toward its usual rate. These two subdivisions affect the heart, not the skeletal muscles that move her legs. A complete model should connect both motor branches to the CNS, then show somatic output to leg muscles and autonomic output to the heart.

2 ANSWER WITH EVIDENCE

Use the passage

1. In a model of Maya's response, which structures belong inside the CNS, and what PNS structures connect the CNS to the rest of her body?

2. Draw two arrows in words: one for the horn's incoming signal and one for the command to step back. Label each arrow with its PNS division.

3. The model needs two outgoing branches from the CNS. What motor branch and target would you label for stepping back, and what motor branch and target would you label for the faster heartbeat?

4. How would you label the autonomic routes that affect Maya's heartbeat before and after the car passes?

3 YOUR TURN

Your own words

A school fire alarm sounds. In the box, draw a labeled model that traces the signal from ear receptors to your decision to walk toward an exit, a faster heartbeat, and a return toward your usual heartbeat after you are safe. Show the CNS and PNS, the sensory and motor divisions, both motor branches, and the two autonomic subdivisions; use arrows to show signal directions.

Signal Routes

PART 1 · READ AND MARK

Circle the physical parts of the nervous system, underline its named divisions and subdivisions, and number the steps from detecting the horn to stepping back. Accept any marking that follows this job and points at the right text.

PART 2 · ANSWERS

#	QUESTION	ANSWER
1	In a model of Maya's response, which structures belong inside the CNS, and what PNS structures connect the CNS to the rest of her body?	**The brain and spinal cord belong in the CNS. Nerves outside them belong in the PNS and connect the CNS with receptors, muscles, and organs.**
2	Draw two arrows in words: one for the horn's incoming signal and one for the command to step back. Label each arrow with its PNS division.	**Ear receptors → CNS: sensory division. CNS → leg muscles: motor division.**
3	The model needs two outgoing branches from the CNS. What motor branch and target would you label for stepping back, and what motor branch and target would you label for the faster heartbeat?	**Somatic branch → skeletal muscles in the legs; autonomic branch → heart.**
4	How would you label the autonomic routes that affect Maya's heartbeat before and after the car passes?	**Sympathetic subdivision → faster heartbeat during the urgent moment; parasympathetic subdivision → heartbeat slows toward its usual rate after she is safe.**

PART 3 · YOUR TURN (SAMPLE ANSWER)

Ear receptors → PNS sensory division → CNS (brain and spinal cord). CNS → PNS motor division → somatic branch → leg skeletal muscles → walk toward exit. CNS → PNS motor division → autonomic branch → sympathetic subdivision → heart beats faster. After reaching safety: CNS → PNS motor division → autonomic branch → parasympathetic subdivision → heartbeat slows toward its usual rate.

Accept models that place the brain and spinal cord in the CNS, show sensory input toward the CNS and motor output away from it, and distinguish somatic muscle control from autonomic heart control. The sympathetic and parasympathetic labels must match the stated changes in heartbeat.