Signals in Motion

Trace how the nervous system responds to a sudden event

PS.2.1 "Identify and describe the major divisions of the nervous system."

NAME _____ DATE _____

1 READ AND MARK

Read it twice

YOUR JOB Underline the two major divisions of the nervous system, circle the two functional divisions of the peripheral nervous system, and draw a box around its two autonomic branches.

A Ball in the Street

1. A cyclist rounds a corner and spots a ball rolling into the street. The nervous system helps her detect the ball, decide what to do, and move her hands to the brakes. Its two major divisions are the central nervous system, or CNS, and the peripheral nervous system, or PNS. The CNS consists of the brain and spinal cord. The brain interprets incoming information and plans a response, while the spinal cord carries messages between the brain and much of the body. Some rapid responses can also be coordinated by the spinal cord without waiting for a decision from the brain.

2. The PNS includes nerves and clusters of nerve cells outside the brain and spinal cord. These carry information from the cyclist's eyes and other sense organs toward the CNS and carry commands from the CNS toward muscles and glands. One functional division of the PNS is the somatic nervous system, which carries sensory information and controls voluntary movement of skeletal muscles. When the cyclist chooses to squeeze the brake levers, commands travel through somatic motor nerves to muscles in her hands. Sensory nerves also help her notice the pressure of the levers against her fingers as she slows.

3. Another functional division of the PNS is the autonomic nervous system. It regulates many involuntary processes, including heart rate and digestion. As the ball rolls closer, the sympathetic branch of the autonomic system helps prepare the cyclist for action: her heart beats faster and digestion slows. Once she stops safely and the danger passes, the parasympathetic branch supports a return toward resting conditions: her heart rate slows and digestive activity can increase. Both branches work through the PNS, not as separate divisions beside the CNS and PNS. The same event can involve deliberate movement and automatic changes at once.

2 ANSWER WITH EVIDENCE

Use the passage

1. Identify the two major divisions of the nervous system. What does the CNS contain and do as the cyclist responds?

2. What does the PNS include, and how does it connect the cyclist's body with the CNS?

3. Which functional division of the PNS helps the cyclist squeeze the brakes, and which regulates her changing heart rate? Describe the difference between their jobs.

4. Identify the two branches of the autonomic nervous system. How does each affect the cyclist during or after the danger?

3 YOUR TURN

Your own words

Invent a moment different from the cycling event in which someone notices a surprise, makes a deliberate movement, and then calms down. In five or six sentences, identify and describe the CNS and PNS, the somatic and autonomic divisions, and the sympathetic and parasympathetic branches in your moment.

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PART 1 · READ AND MARK

Underline the two major divisions of the nervous system, circle the two functional divisions of the peripheral nervous system, and draw a box around its two autonomic branches. Accept any marking that follows this job and points at the right text.

PART 2 · ANSWERS

#	QUESTION	ANSWER
1	Identify the two major divisions of the nervous system. What does the CNS contain and do as the cyclist responds?	**The major divisions are the CNS and PNS. The CNS contains the brain and spinal cord; the brain interprets information and plans a response, while the spinal cord carries messages between the brain and much of the body.**
2	What does the PNS include, and how does it connect the cyclist's body with the CNS?	**The PNS includes nerves and clusters of nerve cells outside the brain and spinal cord. It carries sensory information toward the CNS and commands from the CNS toward muscles and glands.**
3	Which functional division of the PNS helps the cyclist squeeze the brakes, and which regulates her changing heart rate? Describe the difference between their jobs.	**The somatic division controls the voluntary movement of her hand muscles. The autonomic division regulates involuntary processes such as her heart rate.**
4	Identify the two branches of the autonomic nervous system. How does each affect the cyclist during or after the danger?	**The sympathetic branch helps prepare her for action by increasing her heart rate and slowing digestion. The parasympathetic branch supports a return toward rest by slowing her heart rate and allowing digestive activity to increase.**

PART 3 · YOUR TURN (SAMPLE ANSWER)

During a school play, Maya hears a loud crash backstage and turns toward it. Nerves in her peripheral nervous system, or PNS, carry sound information to her central nervous system, or CNS, which includes her brain and spinal cord. Her brain interprets the sound, and commands travel through the somatic division of the PNS to the skeletal muscles she uses to step away from a fallen prop. The sympathetic branch of the autonomic division raises her heart rate without her choosing it. When she sees that no one is hurt, the parasympathetic branch helps slow her heart rate toward its resting level.

Accept other accurate examples of voluntary movement and involuntary changes. Students should distinguish the CNS from the PNS and place both the somatic and autonomic divisions within the PNS.