Signals at the Crosswalk

Trace how sensory signals become actions.

PS.2 "Investigate the structure, biochemistry, and circuitry of the brain and the nervous system to understand their roles in affecting behavior. Identify and describe the major divisions of the nervous system..."

NAME _____ DATE _____

1 READ AND MARK

Read it twice

YOUR JOB Underline each sensory structure in the passage, circle each brain area, and number the steps that carry a signal through a neuron. Use your marks to trace how Maya notices the bus and responds.

A Step Back from the Curb

1. At a crowded crosswalk, Maya sees a turning bus, hears its horn, and shifts her weight away from the curb. Light from the bus reaches photoreceptors in her retina, which begin a visual signal sent toward the brain. Sound waves move fluid in the cochlea of her inner ear, bending hair cells that begin auditory signals. Fluid movement in her semicircular canals signals head rotation, helping her keep her balance. The smell of fresh bread starts when airborne molecules bind to receptors in her nose. These sensory systems convert different kinds of energy or chemicals into neural signals.

2. The central nervous system, the brain and spinal cord, processes incoming signals. The peripheral nervous system carries signals between that center and the rest of the body. Its somatic division helps Maya deliberately step back by sending commands to skeletal muscles; its autonomic division adjusts functions such as heart rate without a deliberate choice. In her brainstem, the midbrain helps orient her toward sudden sights and sounds, the pons helps regulate breathing, and the medulla helps maintain breathing and heartbeat. Her spinal cord carries commands toward her leg muscles, while peripheral nerves complete the route.

3. The occipital cortex helps Maya interpret the bus's shape, while the temporal cortex helps process its horn. The frontal cortex helps her choose to wait, and its motor area sends movement commands. In the limbic system, the amygdala helps assess danger, while the hippocampus can link this moment to a memory. Within a neuron, branching dendrites receive signals, the cell body integrates them, and an electrical impulse travels along the axon. At its endings, chemical neurotransmitters cross a tiny synapse to another cell. If that communication is disrupted, perception, decisions, and movement may change.

2 ANSWER WITH EVIDENCE

Use the passage

1. Compare how Maya's eyes and ears begin signals about the bus. What reaches each sensory structure?

2. Trace how the central nervous system, peripheral nervous system, and somatic division help Maya step back. How is the autonomic division's role different?

3. Which cortex area helps Maya process the horn, and which limbic structure helps her assess danger? Describe each role.

4. Trace a signal from a neuron's dendrites to the next cell. How could a disruption along that route affect Maya?

3 YOUR TURN

Your own words

Imagine a soccer goalkeeper sees a ball coming and hears a teammate call "left." In four sentences, explain how both sensory systems, at least one brain area, a nervous system division, and neural transmission could help the goalkeeper respond.

Signals at the Crosswalk

PART 1 · READ AND MARK

Underline each sensory structure in the passage, circle each brain area, and number the steps that carry a signal through a neuron. Use your marks to trace how Maya notices the bus and responds. Accept any marking that follows this job and points at the right text.

PART 2 · ANSWERS

#	QUESTION	ANSWER
1	Compare how Maya's eyes and ears begin signals about the bus. What reaches each sensory structure?	**Light reaches photoreceptors in the retina and begins a visual signal. Sound waves move fluid in the cochlea, bending hair cells that begin an auditory signal.**
2	Trace how the central nervous system, peripheral nervous system, and somatic division help Maya step back. How is the autonomic division's role different?	**The brain and spinal cord process signals and send movement commands. Peripheral nerves carry commands to skeletal muscles through the somatic division. The autonomic division adjusts functions such as heart rate without a deliberate choice.**
3	Which cortex area helps Maya process the horn, and which limbic structure helps her assess danger? Describe each role.	**The temporal cortex helps process the horn's sound. The amygdala helps assess danger.**
4	Trace a signal from a neuron's dendrites to the next cell. How could a disruption along that route affect Maya?	**Dendrites receive signals, the cell body integrates them, and an impulse travels along the axon. Neurotransmitters cross the synapse to another cell. A disruption could change Maya's perception, decision, or movement.**

PART 3 · YOUR TURN (SAMPLE ANSWER)

Light from the ball reaches photoreceptors in the goalkeeper's retina, while the teammate's call moves fluid in the cochlea and bends hair cells. The occipital cortex helps interpret the ball's position, and the temporal cortex helps process the call. Neurons carry electrical impulses along axons and release neurotransmitters across synapses as the brain selects a response. The somatic division of the peripheral nervous system carries commands to skeletal muscles, allowing the goalkeeper to dive left.

Accept other accurate brain areas and responses in Part 3 if the student explains their roles. The four-sentence response must connect both senses, a brain area, a nervous system division, and neural transmission to the goalkeeper's action.