Signals Before Speaking

Trace how neurons and neurotransmitters contribute to behavior.

P.2.3 "Describe the structure and function of the neuron and the basic process of neurotransmission, including the effect of neurotransmitters (e.g., serotonin, dopamine, norepinephrine, endorphins) and the effect on human behavior."

NAME _____ DATE _____

1 READ AND MARK

Read it twice

YOUR JOB Underline the parts of a neuron, circle the names of neurotransmitters, and number the release, binding, and clearing of neurotransmitters in order. Use your marks to trace how a signal moves and may affect behavior.

Maya Takes the Stage

1. Minutes before a class presentation, Maya notices her name on the screen and grips her note cards. In a neuron, branching dendrites receive messages from other cells. The cell body, or soma, combines incoming signals; if the combined input crosses a threshold, an electrical impulse starts near the beginning of the axon. The impulse travels down this long fiber toward its terminals. A fatty covering called myelin helps the impulse move efficiently along many axons. At the terminals, the electrical message can lead to a chemical message for another cell. These linked cells help Maya notice the cue and begin speaking.

2. Neurons do not usually touch at their communication points. A tiny gap called a synapse separates an axon terminal from the next cell. When an impulse reaches the terminal, it triggers the release of neurotransmitters into the gap. These chemicals bind to matching receptors on the receiving cell, changing how likely that cell is to send its own impulse. The effect depends on the receptor and the circuit, not just the chemical's name. Transporters can take some neurotransmitter back into the sending cell, and enzymes can break some down. This clearing helps keep signals from lasting indefinitely.

3. As Maya begins, norepinephrine helps regulate alertness and attention, which may help her focus on the audience. Dopamine is involved in motivation and learning from rewards; a friendly nod may reinforce her effort. Serotonin helps regulate mood and other functions, so changes in its signaling may affect how Maya feels, but it is not a simple happiness switch. Endorphins are chemicals the body produces that can reduce pain and contribute to relief during stress. No single neurotransmitter determines whether Maya speaks confidently. Her thoughts, past practice, body state, and social setting also shape her behavior.

2 ANSWER WITH EVIDENCE

Use the passage

1. How do the dendrites, cell body, and axon work together to carry a signal after Maya sees her name?

2. Trace what happens when an impulse reaches an axon terminal. How can the message affect the next cell, and how is it cleared?

3. How might norepinephrine and dopamine each contribute to Maya's behavior during the presentation?

4. How might serotonin and endorphins affect Maya differently? Why would neither chemical alone explain her confidence?

3 YOUR TURN

Your own words

Choose an everyday situation other than giving a presentation. In five sentences, trace a signal from dendrites through an axon and across a synapse, connect two named neurotransmitters to possible behavior, and explain why the chemicals alone cannot predict the behavior.

Signals Before Speaking

PART 1 · READ AND MARK

Underline the parts of a neuron, circle the names of neurotransmitters, and number the release, binding, and clearing of neurotransmitters in order. Use your marks to trace how a signal moves and may affect behavior. Accept any marking that follows this job and points at the right text.

PART 2 · ANSWERS

#	QUESTION	ANSWER
1	How do the dendrites, cell body, and axon work together to carry a signal after Maya sees her name?	**Dendrites receive signals, and the cell body combines them. If the input crosses a threshold, an impulse travels along the axon toward its terminals.**
2	Trace what happens when an impulse reaches an axon terminal. How can the message affect the next cell, and how is it cleared?	**The terminal releases neurotransmitters into the synapse. They bind to receptors and change the next cell's chance of firing. Transporters take some back, while enzymes break some down.**
3	How might norepinephrine and dopamine each contribute to Maya's behavior during the presentation?	**Norepinephrine may help Maya stay alert and focus on the audience. Dopamine may help her learn from the reward of a friendly nod.**
4	How might serotonin and endorphins affect Maya differently? Why would neither chemical alone explain her confidence?	**Serotonin signaling may affect her mood, while endorphins can reduce pain and contribute to relief during stress. Her practice, thoughts, body state, and social setting also shape her behavior.**

PART 3 · YOUR TURN (SAMPLE ANSWER)

Before a basketball game, Jordan feels nervous but runs onto the court. Dendrites receive signals, the cell body combines them, and an impulse travels down an axon to its terminals. At a synapse, released neurotransmitters bind to receptors on another cell and change its chance of firing. Norepinephrine may support Jordan's alertness, while dopamine may help Jordan learn from the reward of a successful pass. Neither chemical alone explains the play, because practice and teammates also affect Jordan's choices.

Accept other accurate links between the named neurotransmitters and behavior. Responses should treat each effect as a possibility, not as a guaranteed outcome caused by one chemical.