The Goalie's Dive

How chemical messages help turn a sight into an action

HAP.5.c "Construct an explanation of the role of neurotransmitters in the functions and behavior of the nervous system."

NAME _____ DATE _____

1 READ AND MARK

Read it twice

YOUR JOB Circle each named neurotransmitter, underline what it does to a receiving cell, and number the steps that connect the goalie's sight of the ball to the dive.

From Sight to Save

1. A soccer goalie sees a ball curve toward the left corner. Light from the ball activates cells in the eyes, and nerve signals travel toward the brain. Within a neuron, a signal travels electrically. Between neurons, a tiny gap called a synapse separates the sending cell from the receiving cell. When a signal reaches the end of the sending neuron, it releases chemical messengers called neurotransmitters. These chemicals cross the gap and attach to receptors on the receiving cell. The receptor response can change whether that cell sends its own signal. This relay helps turn a changing view into a response.

2. The goalie needs to choose a dive, not just notice the ball. In many brain circuits, glutamate makes a receiving neuron more likely to send a signal. This helps activity spread through circuits that interpret the ball's path and plan a movement. In other circuits, GABA makes a receiving neuron less likely to send a signal. Such inhibition can reduce activity in a competing movement plan, so the goalie does not try to dive both left and right. These chemicals do not carry a fixed command such as “dive left.” Their effects depend on the receptors and circuits involved.

3. When the goalie dives, motor neurons carry signals from the spinal cord to muscles. At the connection between a motor neuron and a skeletal muscle fiber, the neuron releases acetylcholine. It binds to receptors on the muscle fiber and starts events that make the fiber contract. Other muscles must also relax or contract in a coordinated pattern. After release, neurotransmitters are removed or broken down, which limits how long their signals last. If neurotransmitter release, receptor binding, or removal changes, the goalie's movement may change. Behavior depends on these chemical messages working with electrical signals in connected circuits, not on one chemical acting alone.

2 ANSWER WITH EVIDENCE

Use the passage

1. How can a signal reach another neuron even though a synapse separates the two cells?

2. How could glutamate help the goalie move in response to the ball's path?

3. Why might GABA help the goalie choose one dive instead of attempting two competing movements?

4. How do acetylcholine and neurotransmitter removal each affect the goalie's dive?

3 YOUR TURN

Your own words

A student hears a bicycle bell and steps back from a path. In 4 to 5 sentences, explain how glutamate, GABA, and acetylcholine could help produce this response, and why no single chemical controls it alone.

The Goalie's Dive

PART 1 · READ AND MARK

Circle each named neurotransmitter, underline what it does to a receiving cell, and number the steps that connect the goalie's sight of the ball to the dive. Accept any marking that follows this job and points at the right text.

PART 2 · ANSWERS

#	QUESTION	ANSWER
1	How can a signal reach another neuron even though a synapse separates the two cells?	**The sending neuron releases neurotransmitters that cross the synapse and bind to receptors on the receiving neuron, changing whether it sends a signal.**
2	How could glutamate help the goalie move in response to the ball's path?	**Glutamate can make neurons in relevant brain circuits more likely to send signals, helping those circuits interpret the ball's path and plan a movement.**
3	Why might GABA help the goalie choose one dive instead of attempting two competing movements?	**GABA can make neurons less likely to send signals, reducing activity in a competing movement plan.**
4	How do acetylcholine and neurotransmitter removal each affect the goalie's dive?	**Acetylcholine binds to muscle receptors and starts events that cause contraction. Removing or breaking down neurotransmitters limits how long their signals last.**

PART 3 · YOUR TURN (SAMPLE ANSWER)

After the student hears the bell, glutamate could make neurons in brain circuits more likely to send signals as they process the sound and plan a step back. GABA could make neurons in a competing movement plan less likely to send signals, reducing a move forward. Motor neurons could then release acetylcholine onto skeletal muscle fibers, starting contractions that help the student step back. The response depends on these messages acting in connected circuits, not on one neurotransmitter giving a complete command.

Accept other plausible competing movements in the open response. Look for each neurotransmitter's effect on signaling and a clear link between those effects and the student's behavior.