Messages in Motion

Classify neurotransmitters by chemistry and function

HS-AP5-5 "Identify the various classification of neurotransmitters and their associated functions."

NAME _____ DATE _____

1 READ AND MARK

Read it twice

YOUR JOB Underline each neurotransmitter named in the passage, circle its chemical class, and number one function linked to it. Use your marks to compare messengers that share a class but do different jobs.

Signals During a Race

1. At the starting line of a race, a runner hears the starting signal and pushes off the track. Between nerve cells, chemical messengers called neurotransmitters cross tiny gaps called synapses and bind to receptors on other cells. Scientists classify these messengers by chemical structure, then describe what they do in particular circuits. The amino acid glutamate usually increases the chance that a receiving neuron will fire. It helps brain circuits transmit information and form memories. Two other amino acid messengers, GABA and glycine, usually decrease that chance. GABA provides widespread inhibition in the brain, while glycine helps limit signals in the spinal cord.

2. The runner's muscles need precise instructions. Acetylcholine is an ester, a chemical class different from amino acids. At a nerve-muscle junction, it binds to receptors on a muscle cell and triggers contraction. In the heart, acetylcholine can slow the heartbeat. Monoamines form another class of neurotransmitters. Dopamine supports movement and learning from rewards, while serotonin helps regulate mood and sleep. Norepinephrine raises alertness and directs attention during a challenge. These three monoamines do not have identical jobs, even though they share a chemical class. Their effects depend on the cells and receptors they reach.

3. After the race, the runner feels an ache in one ankle. Some neurons release endorphins, members of the neuropeptide class, which consists of short chains of amino acids. Endorphins help reduce pain signaling, making an injury feel less painful, although they do not repair damaged tissue. Chemical class describes a messenger's makeup, not a guaranteed effect on every target. A messenger may act differently when it binds to a different receptor or reaches a different kind of cell. To explain a signal accurately, name both the messenger's chemical class and its function in the specific setting.

2 ANSWER WITH EVIDENCE

Use the passage

1. What chemical class do glutamate, GABA, and glycine share? Compare their usual effects on a receiving neuron's chance of firing.

2. Which chemical class includes dopamine, serotonin, and norepinephrine? Give one function of each.

3. Classify acetylcholine by chemical group. How do its effects at a nerve-muscle junction and in the heart differ?

4. Which class includes endorphins, and what do they do? Why can't chemical class alone predict every effect of a neurotransmitter?

3 YOUR TURN

Your own words

Imagine a student learning a new piano piece. In four or five sentences, name one neurotransmitter from each of three different chemical classes and connect each to a passage-supported function that could matter during practice. Explain why chemical class alone cannot predict every effect.

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PART 1 · READ AND MARK

Underline each neurotransmitter named in the passage, circle its chemical class, and number one function linked to it. Use your marks to compare messengers that share a class but do different jobs. Accept any marking that follows this job and points at the right text.

PART 2 · ANSWERS

#	QUESTION	ANSWER
1	What chemical class do glutamate, GABA, and glycine share? Compare their usual effects on a receiving neuron's chance of firing.	**All three are amino acid neurotransmitters. Glutamate usually increases the chance of firing, while GABA and glycine usually decrease it.**
2	Which chemical class includes dopamine, serotonin, and norepinephrine? Give one function of each.	**They are monoamines. Dopamine supports movement or learning from rewards, serotonin helps regulate mood or sleep, and norepinephrine raises alertness or directs attention.**
3	Classify acetylcholine by chemical group. How do its effects at a nerve-muscle junction and in the heart differ?	**Acetylcholine is an ester. It triggers muscle contraction at a nerve-muscle junction but can slow the heartbeat in the heart.**
4	Which class includes endorphins, and what do they do? Why can't chemical class alone predict every effect of a neurotransmitter?	**Endorphins are neuropeptides that reduce pain signaling. A messenger's effect can depend on the receptor or type of cell it reaches.**

PART 3 · YOUR TURN (SAMPLE ANSWER)

As the student learns the notes, glutamate, an amino acid neurotransmitter, helps brain circuits form memories. Acetylcholine, an ester, triggers the finger muscles to contract as the student presses the keys. Dopamine, a monoamine, supports movement and learning from rewards when the student hears a phrase played correctly. Chemical class alone cannot predict every effect because a messenger's effect also depends on the receptors and cells it reaches.

Accept any passage-supported function for each messenger. For Part 3, check for three distinct chemical classes, a relevant function for each, and a receptor- or cell-based explanation of why effects can vary.