Signals at the Game

Trace how sensory information reaches the brain.

PS.2.4 "Explain the processes of sensation, including the structures and functions of visual, auditory, kinesthetic/vestibular, and chemical sensory systems."

NAME _____ DATE _____

1 READ AND MARK

Read it twice

YOUR JOB Underline one stimulus for each of these systems: visual, auditory, kinesthetic or vestibular, and chemical. Circle the receptor structure that detects each stimulus, then number the steps from that stimulus to the brain.

More Than Meets the Eye

1. At a basketball game, you spot a teammate cutting toward the hoop and hear shoes squeak across the court. Light reflected from the teammate enters your eye through the pupil. The lens focuses it on the retina, where rods and cones turn light into nerve signals. The optic nerve carries those signals toward the brain, which uses them to recognize movement. Meanwhile, sound waves from the shoes vibrate your eardrum. Tiny middle-ear bones pass the vibrations into the fluid-filled cochlea. Hair cells there convert the motion into nerve signals that travel along the auditory nerve to the brain.

2. During a quick turn to follow the play, your brain also needs information about your limbs that vision and hearing do not provide directly. Receptors in muscles, tendons, and joints send signals about stretch and movement. This kinesthetic sense, also called proprioception, helps you know where your arms and legs are without looking. Inside the inner ear, fluid in the semicircular canals moves as your head rotates. That movement bends hair cells, which send signals through the vestibular nerve toward the brain. Other inner-ear vestibular structures sense head tilt and straight-line acceleration, helping you keep your balance as you stop.

3. After the game, you pass a popcorn stand and sip lemonade. Airborne odor molecules from the popcorn enter your nose and bind to receptors in its upper lining. Those receptors send signals toward the brain, which identifies the smell. In your mouth, molecules from the lemonade dissolve in saliva and stimulate taste receptor cells in taste buds. Nerves carry their signals to the brain, which identifies tastes such as sour. Smell and taste are chemical senses because their receptors respond to molecules, not light or vibrations. The brain combines these signals with other information to create your experience of food.

2 ANSWER WITH EVIDENCE

Use the passage

1. How does light from the teammate become a signal the brain can use?

2. Trace the shoe squeak from sound waves to the brain. What do the hair cells do?

3. How do kinesthetic and vestibular signals give the brain different information during a quick turn?

4. How do the popcorn smell and lemonade taste begin as signals, and what makes both chemical senses?

3 YOUR TURN

Your own words

Invent a moment outside the game when you move and notice food or drink. In 4 to 5 sentences, trace one chemical sense, one kinesthetic or vestibular sense, and either vision or hearing from stimulus through receptor to brain, explaining what each signal helps you notice or do.

ANSWER KEY

Signals at the Game

PART 1 · READ AND MARK

Underline one stimulus for each of these systems: visual, auditory, kinesthetic or vestibular, and chemical. Circle the receptor structure that detects each stimulus, then number the steps from that stimulus to the brain. Accept any marking that follows this job and points at the right text.

PART 2 · ANSWERS

#	QUESTION	ANSWER
1	How does light from the teammate become a signal the brain can use?	**Light enters through the pupil, and the lens focuses it on the retina. Rods and cones turn it into nerve signals, which the optic nerve carries toward the brain.**
2	Trace the shoe squeak from sound waves to the brain. What do the hair cells do?	**Sound waves vibrate the eardrum. Middle-ear bones pass the vibrations into the cochlea, where hair cells convert the motion into nerve signals carried by the auditory nerve to the brain.**
3	How do kinesthetic and vestibular signals give the brain different information during a quick turn?	**Receptors in muscles, tendons, and joints signal limb position and movement. Vestibular hair cells detect head rotation as fluid moves in the semicircular canals, helping with balance.**
4	How do the popcorn smell and lemonade taste begin as signals, and what makes both chemical senses?	**Popcorn odor molecules bind to receptors in the nose. Lemonade molecules dissolve in saliva and stimulate taste receptor cells. Both senses begin when receptors respond to molecules and send signals toward the brain.**

PART 3 · YOUR TURN (SAMPLE ANSWER)

As I walk through a bakery, odor molecules from bread bind to receptors in the upper lining of my nose, which send signals toward my brain so I recognize the smell. When I turn my head toward the counter, fluid shifts in my semicircular canals and bends hair cells; signals to my brain help me sense the turn and stay balanced. Light reflected from a price sign enters my eye, and cones in my retina turn it into nerve signals. My optic nerve carries those signals toward my brain, helping me read the sign.

Accept other accurate examples that identify a stimulus, its receptor structure, and a signal traveling toward the brain. For the movement sense, students may use either kinesthetic receptors or vestibular structures.