# Signals at the Crossing

Trace how sensory signals become perceptions.

**P.2.7** "Identify and analyze the mechanisms for sensory input and the process of transduction which informs the brain of environmental stimuli; and, explain how the brain interprets the stimuli through perceptual processes."

NAME _____ DATE _____

## 1 READ AND MARK

Read it twice

**YOUR JOB** Underline each physical stimulus, circle the words that describe how a receptor converts it into an electrical signal, and number each place where Maya's brain interprets a signal. Use your marks to trace the path from the environment to perception.

### What Maya Notices

1. At a crowded crossing, Maya hears a bicycle bell behind her. The bell shakes the air, sending pressure waves into her ear. Her eardrum vibrates, and tiny bones pass the motion to fluid in the cochlea. Movement of that fluid bends hair cells, which convert the motion into electrical signals. This conversion is called transduction. Nerve signals travel to the brain, where sound-processing areas detect features such as pitch and timing. Maya identifies the sound as a nearby bicycle bell, rather than just a series of vibrations, because her brain combines those features with what she knows about street sounds.

2. At the same crossing, a red light glows on the back of a car. Light from the lamp enters Maya's eyes and reaches the retina. Photoreceptors in the retina turn light into electrical signals, another example of transduction. Signals move through retinal circuits and along the optic nerve toward the brain. Visual areas process color, shape, location, and motion. Maya sees the red lamp as a brake light because it is attached to a car that is slowing down. Without that setting, a small red glow might be a sign or a reflection. Perception is the brain's interpretation of sensory signals, not a copy of the world.

3. Maya presses the metal crossing button while watching the cars. Pressure slightly changes the shape of receptors in the skin of her fingertip. These receptors convert the physical pressure into electrical signals that travel through sensory nerves and the spinal cord to the brain. The brain's touch-processing areas help her locate the pressure at her fingertip. Still, feeling the button move does not prove it controls the traffic light. Maya has to use context, such as whether the walk signal changes, to decide what the movement means. Attention also matters: if she focuses on the bicycle, she may barely notice the button's movement.

## 2 ANSWER WITH EVIDENCE

Use the passage

1. Compare how the bicycle bell and the red lamp become electrical signals. Name the physical input and the receptor for each.

2. Trace the signal from Maya's fingertip to her brain. How does her brain use that signal?

3. Why does Maya perceive the red glow as a brake light instead of a sign or reflection?

4. Maya's fingertip receptors may signal that the button moved, yet she might barely notice it. What explains this difference?

## 3 YOUR TURN

Your own words

Imagine a new moment in a school cafeteria. In four or five sentences, choose a sight, sound, or touch and trace it from a physical stimulus through receptor transduction and nerve signaling to your brain's interpretation. Explain how context or attention could affect what you perceive. Do not use a bicycle bell, brake light, or crossing button.

# Signals at the Crossing



## PART 1 · READ AND MARK

Underline each physical stimulus, circle the words that describe how a receptor converts it into an electrical signal, and number each place where Maya's brain interprets a signal. Use your marks to trace the path from the environment to perception. Accept any marking that follows this job and points at the right text.

## PART 2 · ANSWERS

| # | QUESTION | ANSWER |
|---|---|---|
| 1 | Compare how the bicycle bell and the red lamp become electrical signals. Name the physical input and the receptor for each. | **The bell produces pressure waves that bend hair cells in the cochlea, which convert the motion into electrical signals. Light from the lamp reaches retinal photoreceptors, which convert it into electrical signals.** |
| 2 | Trace the signal from Maya's fingertip to her brain. How does her brain use that signal? | **Skin receptors convert pressure into electrical signals that travel through sensory nerves and the spinal cord to the brain. Touch-processing areas help Maya locate the pressure at her fingertip.** |
| 3 | Why does Maya perceive the red glow as a brake light instead of a sign or reflection? | **Her brain uses context: the glow is attached to a car that is slowing down.** |
| 4 | Maya's fingertip receptors may signal that the button moved, yet she might barely notice it. What explains this difference? | **Her attention may be focused on the bicycle. A signal can reach the brain without becoming the focus of her perception.** |

## PART 3 · YOUR TURN (SAMPLE ANSWER)

Light from a blue puddle on a cafeteria table enters my eyes. Photoreceptors in my retina convert the light into electrical signals that travel toward my brain through the optic nerve. My brain processes the color and shape. Seeing an open sports drink beside the puddle makes me interpret the blue patch as a spill rather than a painted mark. If I were looking for my friends, I might overlook the puddle.

Accept other accurate sensory pathways. The response should distinguish conversion of a physical stimulus into electrical signals from the brain's interpretation of those signals.