

Pulse Message Lab

Trace how a designed device sends information with electromagnetic waves.

S8P4.c "Design a device to illustrate practical applications of the electromagnetic spectrum (e.g., communication, medical, military)."

NAME _____

DATE _____

1 READ AND MARK _____ Read it twice

YOUR JOB Underline each device part and circle the words that tell what it does. Number the steps that show how a message travels from the sender to the receiver.

An Infrared Pulse Communicator

- ① Engineers can design a simple communication device that sends information with infrared light, a part of the electromagnetic spectrum. A battery provides electrical energy to a circuit. When a sender presses a switch, the closed circuit lets current flow through an infrared LED. The LED changes electrical energy into invisible infrared light pulses. Each short or long pulse can stand for part of a prearranged code. The switch starts and stops each pulse, so the sender controls the message.
- ② At the receiving end, a photodiode faces the sender's LED. Infrared light striking the photodiode produces a small electrical signal. A receiver battery powers a buzzer circuit, and a transistor uses the photodiode's signal to switch that circuit on and off. The buzzer makes a sound for each received pulse. A resistor limits current in the LED circuit, protecting the LED and helping it work reliably. Both devices need a clear, direct path between the LED and photodiode.
- ③ This device models a practical use of infrared communication, such as a TV remote sending commands to a television. Engineers first choose a message, such as a three-pulse call signal, and write the code. They sketch the circuit and label each part's job before building. During testing, they check whether the receiver buzzer matches the sent pulse pattern. If room light causes false signals, they can shade the photodiode or move the devices closer. A design succeeds when it sends the chosen information accurately.

2 ANSWER WITH EVIDENCE Use the passage

1 For the sending circuit, name the battery, switch, and infrared LED. What job does each part do?

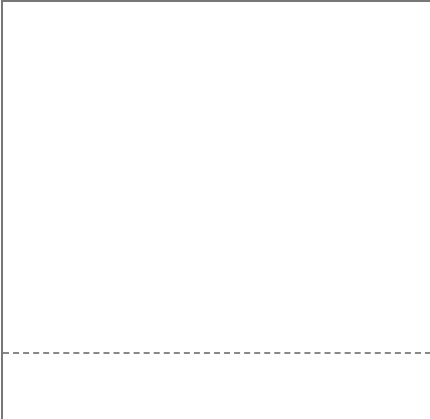
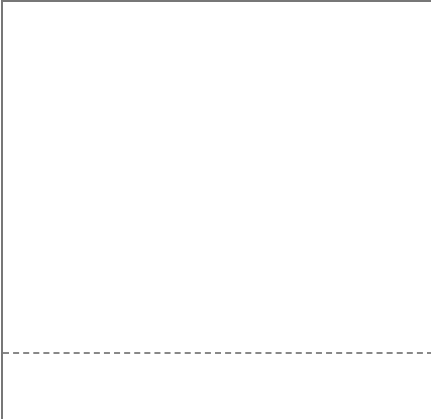
2 Explain how a light pulse causes the receiver buzzer to make a sound.

3 What change could an engineer make if room light causes false signals? Explain why it could help.

4 What result would show that the infrared communicator design works accurately?

3 YOUR TURN Your own words

Design a three-panel sketch of a device that uses electromagnetic waves for communication, medical work, or military work. Label an energy source, a transmitter, the electromagnetic wave, a receiver, and an output, then write two sentences explaining what information the device sends and how it is useful.

		
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PART 1 • READ AND MARK

Underline each device part and circle the words that tell what it does. Number the steps that show how a message travels from the sender to the receiver. Accept any marking that follows this job and points at the right text.

PART 2 • ANSWERS

#	QUESTION	ANSWER
1	For the sending circuit, name the battery, switch, and infrared LED. What job does each part do?	The battery provides electrical energy. The switch controls when current flows and starts or stops pulses. The infrared LED changes electrical energy into infrared light pulses.
2	Explain how a light pulse causes the receiver buzzer to make a sound.	Infrared light hits the photodiode and produces a small electrical signal. A transistor uses that signal to switch the battery-powered buzzer circuit on and off, so the buzzer sounds for each pulse.
3	What change could an engineer make if room light causes false signals? Explain why it could help.	Shade the photodiode or move the devices closer. Either change can reduce unwanted room light reaching the photodiode or make the intended infrared signal stronger.
4	What result would show that the infrared communicator design works accurately?	The receiver buzzer should produce the same pulse pattern that the sender sent, matching the chosen code.

PART 3 • YOUR TURN (SAMPLE ANSWER)

Panel 1 labels: microphone, battery, radio transmitter, antenna Panel 2 label: radio waves through air Panel 3 labels: receiving antenna, radio receiver, speaker The radio waves carry a firefighter's spoken message from one radio to another. This device helps a rescue team communicate when members cannot see each other.

Accept any accurate, practical electromagnetic-spectrum device with a logical path from energy source and transmitter to receiver and output. The student explanation should identify information carried by the wave and a realistic use.