



NERVOUS ENERGY (1 OF 2)

This advanced experiment helps students use simple materials to simulate how nerve impulses travel from one neuron to another in the form of electrical signals. It appears in the section *The Body Electric*.

MATERIALS

- 4 AA batteries
- 2 battery holders
- 3-volt DC buzzer
- 1 infrared phototransistor
- 1 jumbo super-bright LED (light-emitting diode)
- electrical tape

SAFETY FIRST

Students should be supervised by an adult while doing this experiment.

Explain to students that electricity can be dangerous if it is not handled correctly, and emphasize that they should never experiment with the electricity that comes from a wall outlet. It's much more powerful than the electricity made by small batteries and could seriously injure or even kill someone.

SETUP

Arrange the equipment exactly as shown and described. The experiment will not work unless all the connections are made correctly. In addition, the LED must line up with the phototransistor.

OBJECTIVE

Students will see how the transmission of nerve impulses from one neuron to the next within the human body can be modeled using common electrical components.



NERVOUS ENERGY (2 OF 2)

QUESTIONS AND ANSWERS

5 What do the parts of the setup represent?

The hardware in this experiment models the parts involved in conveying nerve impulses from one neuron to another in the body. The batteries correspond to the neuron cell bodies. The wires attached to the LED correspond to the axon. The large LED corresponds to the axon tip. The space between the LED and the phototransistor corresponds to the synapse. The phototransistor and the wires attached to it correspond to a dendrite. And the electricity corresponds to the nerve impulse.

- **Batteries** = Neuron cell bodies
- **Wires** = Axons
- **Large LED** = Axon tip
- **Space between the LEDs** = Synapse
- **Phototransistor** = Dendrite
- **Electricity** = Nerve impulse

6 How is the light from the LED like the neurotransmitters released by an axon tip?

Just as a neurotransmitter is released by an axon tip and must cross the synapse to be received by a dendrite, so light from the LED must jump a gap in the circuit to travel through the air to the phototransistor.

7 Why do you think the buzzer was used in this demonstration?

The buzzer was used in this demonstration to verify that the signal was actually received by the phototransistor.

8 What might the buzzer represent in the body?

Students' answers will vary regarding what the buzzer represents in the body. The buzzer is like the brain, which takes note of a stimulus. It could also be thought of as the body's physical response to a stimulus.