

Ages:

10 to 13

Activity 4:

Create a Short Circuit

(Adapted from *4-H Electrical Science Program -- Electrical Projects and Idea Sheets*. See “More Great Resources for Grab and Go with Science Activities” for more information.)

Contributor: Tim Davis, Ontario County Cooperative Extension

Main idea: There are times when electrical current tries to find a shortcut through the circuit. For example, if you accidentally connect a light bulb circuit so that there is a direct path through the wires from the positive terminal to the negative terminal of the battery, the electricity will not flow to the light, but will go directly through the wire back to the battery. This is a short circuit.

Objective: Youth will build and understand the dangers of a short circuit.

Materials: For each pair:

- q Screwdrivers
- q 2 pieces of conductor wire

- q Circuit board (see handout distributed at session)
- q D-cell batteries (4 four each circuit board)

Motivator: Use the question below to pique interest.

Questions: What could cause a short circuit? (Wires accidentally connected wrong. Two bare wires touching.)

Activity:

1. Use the switched circuit that you made in Activity 3. Leave the switch open.
2. Attach one end of second piece of conductor wire to one terminal of the bulb socket, and the other end to the other socket terminal along with the wires from the battery and the switch.
3. Close the switch. This time the light will not go on. The piece of wire you added has shorted the light bulb. The electric current has taken the path of least resistance.
4. After a little time, carefully feel one of the wires from the battery. It should become warm quickly. This usually happens with shorts, since more electrons can crowd through the wires than when they had to "work" by operating the light bulb. If the voltage is high enough, such as in a house, a short like this can cause the wires to literally melt in a flash. This is the cause of many house fires.

Learning checks: After the activity, the youth are able to:

- q Explain why exposed electrical wires are dangerous. (If someone touches exposed electrical wires they can cause a short. The electricity that was meant to "work" somewhere else would pass through them because they would become the path of least resistance.)

Vocabulary:

Short Circuit: A direct path for electrons from the positive terminal of the battery to the negative without going through a load (light).

Extensions: Continue with Activity 5, Assembly of a Simple Fuse.