

Make a Switch

Topic Area

Electric switches and circuits

Introductory Statement

Students will build simple switches to control the flow of electricity in a circuit.

Science

Observing

Drawing conclusions

Materials

For each group:

Part 1

D cell

3 - 15 cm wires, with ends stripped

2 brass paper fasteners

1.5 v bulb and holder or miniature Christmas light paper clip

masking tape

8 x 8 cm piece of tagboard

Part 2

Above materials plus:

2 - 10 cm wires with ends stripped

4 more brass paper fasteners

1 more paper clip

1 more 8 x 8 cm piece of tagboard

Key Questions

Part 1 How can you turn the current on and off in an electrical circuit?

Part 2 How can you turn a light on from two different parts of a room?

Background Information

Most electrical devices have switches of one type or another, allowing the device to be turned on and off. An electric current will flow only if it has a complete path through which to travel. Switches are simple devices that complete or interrupt that path. When a switch is turned on (closed), it bridges a gap in the wiring, completing a path for electricity. When a switch is turned off (opened), it creates a gap in the circuit and stops the flow of electricity. Most electrical devices are controlled by a single pole switch which works like the one built in *Part 1*.

Some lights or other electrical devices are controlled by two or more switches. Those built in *Part 2* are double pole switches; they allow the device to be turned on or off from either switch.

Management

1. Students should work in groups of two or three.
2. *Part 1* and *Part 2* can be done on the same day or on separate days.
3. Make sure the brass fasteners do not touch underneath the switches. If they do, they will create a short circuit and the switches cannot be turned off.

Procedure

Part 1

1. Discuss the *Key Question*: "How can you turn the current on and off in an electrical circuit?"
2. Distribute the materials and have each group build the circuit and switch pictured. Point out similar switches in the classroom.
3. Discuss the results, and have students fill in their observations and explanations.

Part 2

1. Discuss the second *Key Question*: "How can you turn a light on from two different parts of a room?" Discuss double pole switches located either in the classroom or in students' homes. If your students live in apartments where double pole switches are not common, find some at school they can observe.
2. Build the switches and circuit as shown.
3. Follow directions to operate the switches.
4. Students may need guidance to write the explanation for how the double pole switches work.

Discussion

1. Why is it important to wrap the wire around the brass fasteners?
2. What position does the paper clip have to be in for the bulb to light?
3. Do you think all switches work the same way?
4. What is the advantage of having two double pole switches hooked up to a light?
5. What are some ways that switches are used in the classroom?
6. Why are switches important?
7. How do your switches work?

Extensions

1. Make a switch using other materials.
2. Make diagrams of all the possible switch positions (and whether or not they light the bulb) for the double pole switch circuit.
3. Using a box, make a model of a room with two doors. Wire the light using the circuit made for *Part 2* so that it can be turned on or off from either door.

Curriculum Correlations

Language arts: Remember that when students explain scientific or mathematical procedures to others, they are developing valuable skills in oral language.

Home Links

1. Have students count the number of wall and appliance switches they have at home. How many are single pole? How many are double pole?
2. Challenge students to explain double pole switches to members of their families. Share reactions to the explanations!

Make a Switch

Part 1

How can you make an electric switch?

You will need these things:

8 x 8 cm tagboard

3 - 15 cm pieces of electric wire

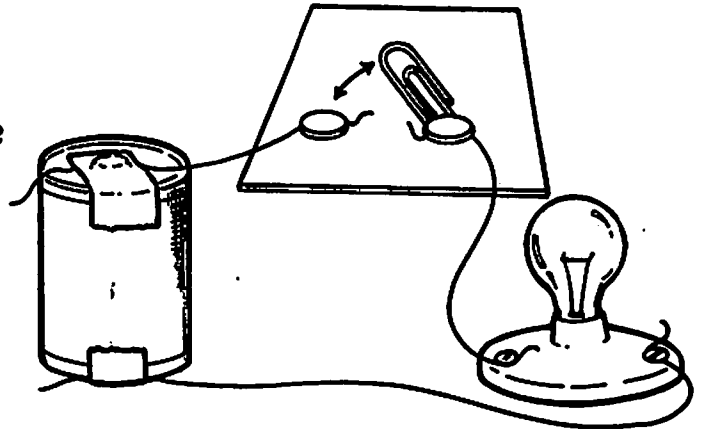
2 brass paper fasteners

1 D cell

1.5 volt bulb and holder

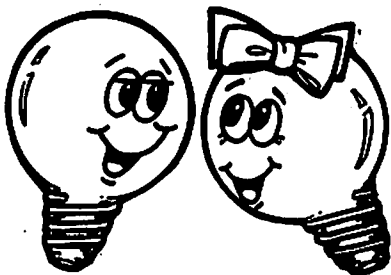
paper clip

masking tape



1. Put a brass fastener through one end of the paper clip and then through the tagboard. Put the other brass fastener through the tagboard so the paper clip can touch it. Tape the ends of the brass fasteners under the tagboard so they do not touch each other.
2. Connect the wires as shown, winding them around the brass fasteners once or twice.
3. Close the switch by pressing the paper clip on the brass fastener.

What happens? _____



Explain how your switch works. _____

Make a Switch Part 2

How can you turn a light on from two different parts of a room?

To build double pole switches, you will need

2 - 8 x 8 cm pieces of tagboard

5 pieces of electric wire

(3 - 15 cm, 2 - 10 cm)

6 brass paper fasteners

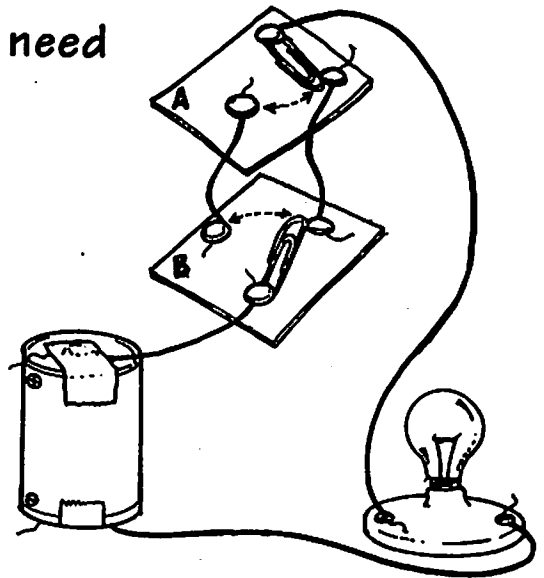
1 D cell

1.5 volt bulb and holder

2 paper clips

masking tape

2 crayons, different colors



1. Set up the circuit as shown here. Tape the ends of the brass fasteners under the tagboard so they do not touch each other.
2. Try the switch in both positions until you make the bulb light. Using a crayon on this sheet, trace the path of the electric current.
3. Turn the light out at Switch A. Turn it on at Switch B. With a differently colored crayon, trace this circuit.

Explain how your double pole switches work.

