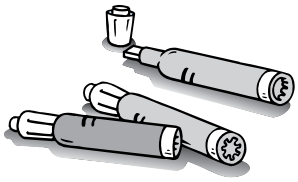
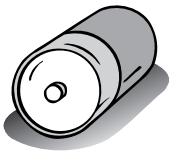
Chapter Science Investigation Name _____

Testing for Electrical Conductivity

What You Need

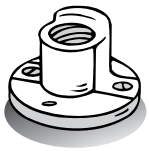


markers

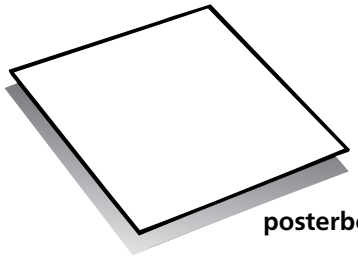


D battery

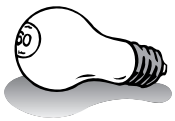
three 51-cm lengths of insulated copper wire with the ends stripped



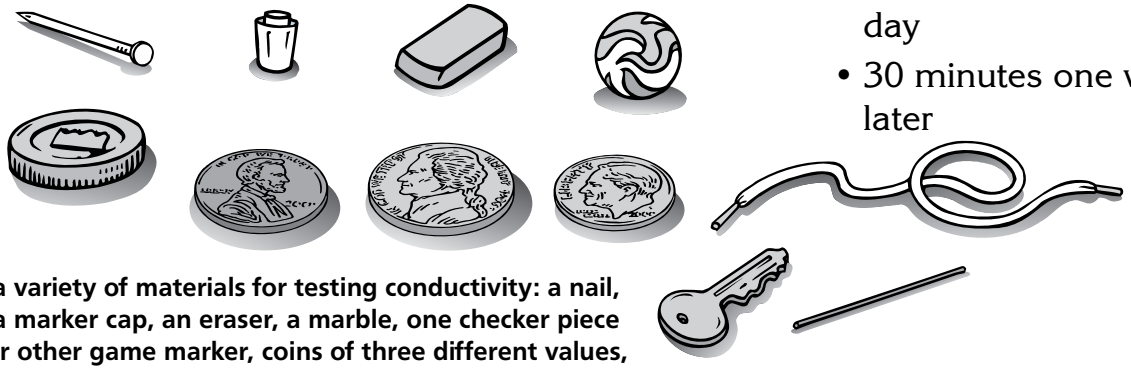
bulb holder



posterboard



lightbulb



a variety of materials for testing conductivity: a nail, a marker cap, an eraser, a marble, one checker piece or other game marker, coins of three different values, a shoelace, a key, pencil "lead"

Find Out

Do this activity to see what materials will conduct an electric current.

Process Skills

Observing
Communicating
Experimenting
Classifying
Designing Investigations

Time

- 30 minutes the first day
- 30 minutes one week later

What to Do

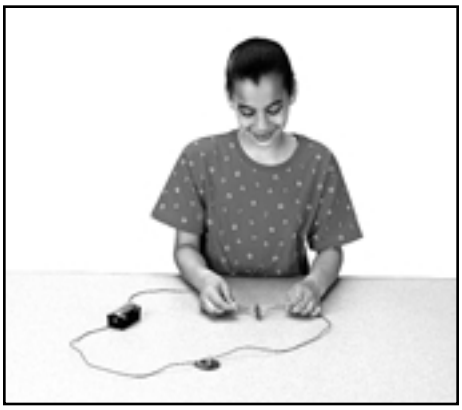
1. Use two copper wires, the battery, bulb, and bulb holder to set up a circuit. **Observe.** Does the light go on? It should. Open and close the circuit several times. **Observe** what happens.

2. Detach one wire from the battery only. Attach a third wire to the battery only.

3. Touch the free ends of the two loose wires to close the circuit. Again, **observe** the light. It should go on.

4. Now place one of the materials for testing conductivity between the free ends of the two loose wires. Then touch both loose wires to the material you are testing. Use the penny first so students will see the light go on.

5. **Observe.** Does the light go on? If it does, the material is conducting an electric current. Open and close this circuit several times and **observe**.



6. During the next week, collect about 15 different materials to test.

7. **Test** your new materials and **record** the results on your chart.

8. **Communicate** your results by making a poster titled "What Conducts Electric Current?" On the poster, write the headings "Insulators" and "Conductors." **Classify** your materials under one of the headings.

Test for Electrical Conductivity	
Material	**Did It Conduct Electricity?**
piece of chalk	**no**

Conclusions

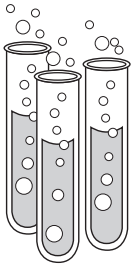
1. What kind of materials conducted electric current?
Answers will vary but should include things made of metal or graphite.

2. What kind of materials do not conduct electric current?
Answers will vary but could include things made of wood or plastic—things that are not made of metal.

New Questions

1. What metals besides copper conduct electric current?
Answers may include aluminum, gold, iron, and silver.

2. How can the materials that did not conduct electric current be used?
Answers may include that these materials could be used to insulate electricity and prevent the flow of current that might cause harm.



Name _____

ACTIVITY

Make a Bulb Light Up

What do you **predict** will happen when you connect the wires to the bulb and battery?

Answers will vary.

Draw the ways you used the wires with the battery. **Write Closed Circuit** or **Didn't Work** beneath each drawing. In the drawings under **Closed Circuit, draw** arrows to show the direction of the electric current.

Answers will vary. Encourage students to experiment with different combinations.

Students must touch the wires to the tip and the base of the bulb for the bulb to light up.

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Conclusions

1. Compare your predictions with your observations.
Answers will vary. The bulb lights up when both ends of the battery and the two parts of the bulb—tip and base—are connected.

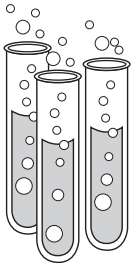
2. What does the battery do in your investigation?
The battery is the energy source.

3. What did you do each time you made the bulb light up?
made a closed circuit

Asking New Questions

1. Why did you fold the aluminum foil on the inside of the tape?
because the tape acts as insulation and prevents short circuits if wires touch

2. Do you need two wires to make the bulb light up?
Explain.
Answers will vary. Two wires can easily be used to make a closed circuit but a closed circuit can also be made using only one wire if the bulb is placed in direct contact with the battery.



Name _____

ACTIVITY

Making Circuits

Draw and **label** Circuit 1.
Student drawings will differ.

What do you **predict** will happen when you remove one of the bulbs?
Answers will vary.

What did you **observe?**
Answers will vary.

Is Circuit 1 a series or parallel circuit? How do you know?
Answers will vary. If it is a series circuit, the circuit was opened when one bulb was removed so all of the bulbs went out.

Draw and **label** Circuit 2.

What do you **predict** will happen when you remove one of the bulbs?
Answers will vary.

What did you **observe?**
Answers will vary.

Is Circuit 2 a series or parallel circuit?
Answers will vary. If it is a parallel circuit, the current could still flow through different parts of the circuit even when one bulb was out. The other bulbs will stay lit.

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Conclusions

1. Compare your predictions with your observations.
Answers will vary.

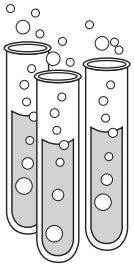
2. What happened in each circuit when you removed a lightbulb?
In a series circuit, the other bulb went out. In a parallel circuit, the other bulb stayed lit.

3. Which circuit had the brighter bulbs? Why?
the parallel circuit, because the bulbs don't share the same amount of energy

Asking New Questions

1. How is removing and replacing a bulb like opening and closing a switch?
It causes a break in the series circuit.

2. Which kind of circuit do you think works better to light your home? Why?
A parallel circuit works best. You can turn each light on and off without affecting others.



Name _____

ACTIVITY

Turning a Magnetic Field On and Off

Did any paper clips stick to the nail? **Record** your results.
none

What happens when you attach the wire to the nail and the battery? **Record** your observations.
The magnetized nail will pick up some paper clips.

How could you pick up more paper clips?
Answers will vary.

Make a **graph** to show the results of each test.
Graphs will vary according to student data.

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Conclusions

1. What happened when you placed the nail in the paper clips when the circuit was closed?
The paper clips were attracted to the nail.

2. What happened when the circuit was opened?
The nail lost its magnetism. It dropped the paper clips it was holding and would not pick up new paper clips.

3. What did you do to pick up more paper clips?
Possible answer: Added more loops to the wire coil. Some students may suggest adding another battery to the circuit.

Asking New Questions

1. What other items could the nail pick up?
Student answers may vary but should include items made of steel or iron.

2. What kind of machine could you make with your electromagnet?
Answers may vary but should include a machine with a magnet that can be turned on and off.