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## 18. Conductor or Not?

What can conduct electricity?

### Materials

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|--|---|
| <input type="checkbox"/> Data collection system                                    | <input type="checkbox"/> Masking tape, ~30 cm |
| <input type="checkbox"/> Voltage sensor  | <input type="checkbox"/> Paper clip           |
| <input type="checkbox"/> AA-cell battery fully charged                             | <input type="checkbox"/> Penny                |
| <input type="checkbox"/> Holiday mini-light bulb (non-LED) with wire ends stripped | <input type="checkbox"/> Plastic spoon        |
| <input type="checkbox"/> Alligator clips (2)                                       | <input type="checkbox"/> Eraser               |
| <input type="checkbox"/> Wire (2), 20 cm, with stripped ends                       | <input type="checkbox"/> Piece of chalk       |
|  | <input type="checkbox"/> Clay                 |

### Safety

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**Always follow your teacher's directions when doing any activity.**

### Investigation

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**After you complete a step or answer a question, place a check mark in the box (☐) next to that step.**

**When you see the symbol "◆" with a superscripted number following a step, refer to the numbered Tech Tips listed in the Tech Tips appendix that corresponds to your PASCO data collection system. There you will find detailed technical instructions for performing that step.**

## Conductor or Not?

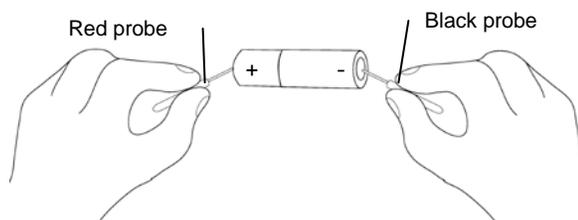
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### Get Started

1.  A battery can push electric charge like a pump can push water through a hose. The strength of a battery's pumping ability is called voltage. Obtain a AA-cell battery from your teacher. Draw a picture of the battery below.

2.  Use your voltage sensor to measure the voltage across the battery as shown in the picture below.
  - a. Start a new experiment on the data collection system. ♦<sup>(1.2)</sup>
  - b. Connect the voltage sensor to your data collection system. ♦<sup>(2.1)</sup>
  - c. Display voltage in a digits display. ♦<sup>(7.3.1)</sup>

**Note:** Make sure to connect the red end of the sensor to the positive end (+) of the battery and the black end of the sensor to the negative end (-) of the battery.



- d. Monitor live voltage data. ♦<sup>(6.1)</sup>

Battery voltage = \_\_\_\_\_ V

3.  What do you think happens to the strength (voltage) of a battery with use? Explain why you think this. Be prepared to share your ideas with the class.

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Let's Explore

In this investigation, you will build a circuit tester with a holiday light.

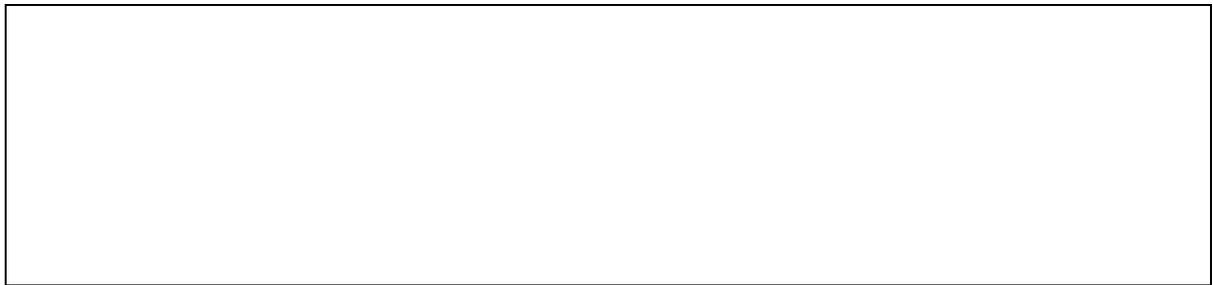
4.  You can use a battery to light a holiday bulb in a complete circuit. A circuit is a complete loop that allows electrical charge to flow. Where do you have to connect the bulb to the battery to make it light?

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5.  Draw a picture of your setup showing the connections.

➤ Drawing of circuit tester setup



6.  Obtain a holiday bulb from your teacher. Make it light by connecting it to your battery. This setup will become your circuit tester.

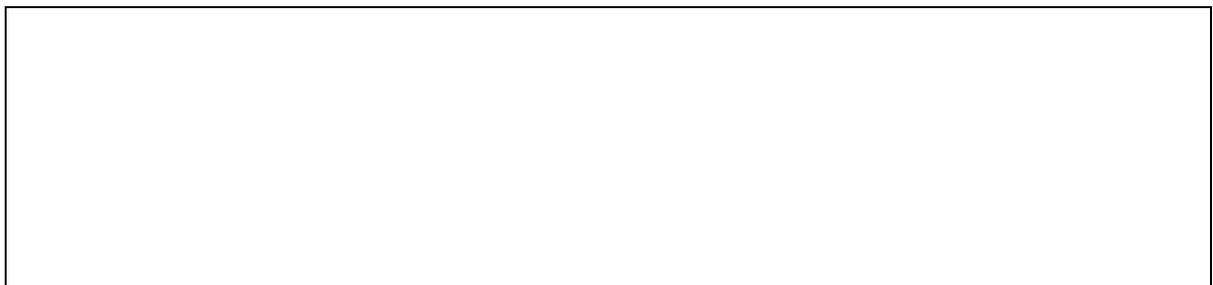
Explain It

7.  Look closely at a holiday bulb. What conducts electrical charge and what does not conduct electrical charge? Draw a picture of the wires and the bulb, and label what conducts and what does not.

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➤ Drawing of what conducts and what does not



## Conductor or Not?

8.  Things that do not conduct electrical charge are called insulators. Think about items and appliances in your house. Why are insulators necessary? Be prepared to share your thoughts with the class.

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9.  In your investigation of what can conduct electricity you learned some new scientific ideas and terms. It is important to be able to discuss your results using these words and terms correctly.

Write the meaning of the following terms in your own words using what you have learned from the lab.

➤ Vocabulary and definitions

Electric circuit	
Electric conductor	
Electric insulator	
Switch	
Light bulb	
Voltage	

Tell Me More

10.  Some materials conduct electrical charge well and some do not. A conductor is a material that allows electrical charge to easily flow through it. Work with your group to list some possible conductors.

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11.  Below is a list of some suggested materials. Make a set of predictions of which you think are conductors. Add any additional materials with your teacher's approval.

Material	"Conductor" or "Not a Conductor"
Penny	
Paper clip	
Plastic spoon	
Rubber band	
Eraser	
Chalk	

12.  Using your circuit tester (AA cell battery and a holiday bulb) can you come up with a way to test whether or not the above materials conduct electrical charge? Make a drawing and describe the setup you are going to use and how it will work.

➤ Drawing of setup

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## Conductor or Not?

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13.  Now use your circuit tester. Check the box for each material that DOES conduct electricity. Use the last boxes to list any additional materials you plan to test.

Penny

Paper clip

Plastic spoon

Rubber band

Eraser

Chalk

14.  Use your voltage sensor to measure the voltage across each item while using the circuit tester. Record the voltages below. Use the last blank spaces to list the names and voltages of any additional materials you plan to test.

Voltage across the penny = \_\_\_\_\_ V

Voltage across the paper clip = \_\_\_\_\_ V

Voltage across the plastic spoon = \_\_\_\_\_ V

Voltage across the rubber band = \_\_\_\_\_ V

Voltage across the eraser = \_\_\_\_\_ V

Voltage across the chalk = \_\_\_\_\_ V

Voltage across the \_\_\_\_\_ = \_\_\_\_\_ V

Voltage across the \_\_\_\_\_ = \_\_\_\_\_ V

Voltage across the \_\_\_\_\_ = \_\_\_\_\_ V

Sum It Up

15.  What can conduct electricity?

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16.  Look back to the list of materials you tested. Are some of them conductors? How do you know?

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17.  Look back to the list of materials you tested. Are some of them insulators? How do you know?

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### Assessment

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#### Multiple Choice

Fill in the bubble to the best answer to each of the questions below. Be prepared to give the reasons for your choices.

1. A good conductor of electricity is
  - Ⓐ Rubber
  - Ⓑ Metal
  - Ⓒ Plastic
2. What happens when an insulator is tested in the circuit tester created in this lab?
  - Ⓐ The circuit tester's bulb does not light.
  - Ⓑ The circuit tester's bulb lights dimly.
  - Ⓒ The circuit tester's bulb lights brightly.
3. When a conductor is tested in a circuit tester, what happens to the bulb?
  - Ⓐ The circuit tester's bulb does not light.
  - Ⓑ The circuit tester's bulb flickers and goes out.
  - Ⓒ The circuit tester's bulb lights.

#### True or False

Enter a "T" if the statement is true or an "F" if it is false.

- \_\_\_\_\_1. Electricity can pass through materials that are conductors.
- \_\_\_\_\_2. All materials are conductors.
- \_\_\_\_\_3. A piece of check and a paper clip are both conductors.