

# INSULATOR OR CONDUCTOR?

## BENCHMARKS and TASK

**SC.B.1.2.1** The student knows how to trace the flow of energy in a system (e.g., as in an ecosystem).

**SC.B.1.2.2** The student recognizes various forms of energy (e.g., heat, light, and electricity).

- The student designs a complete circuit to convert electric potential energy to light energy.

## KEY QUESTION

What materials will conduct electricity?

## BACKGROUND INFORMATION

A direct electric current is a continuous flow of electric charges through a medium called a conductor. In solid conductors (which include all metals), it is the negatively charged electrons that flow and make up the electric current. (In liquids that conduct electricity, the electric charges that flow can be positive, negative, or both.)

Materials that do not normally conduct electricity are called insulators. Other materials that conduct electricity to a lesser degree than conductors, but more than insulators, are called semiconductors.

## MATERIALS

### Teacher

1 appliance or extension cord

### Per group

wire (15-25 cm long with ends stripped)

D-cell

flashlight bulb

1 battery holder

1 bulb holder

various materials to be tested (see activity sheet)

*Insulator or Conductor?* activity sheet

wire strippers

## TEACHING TIPS

1. Prior to the lesson, familiarize students with the correct procedure for using the battery and bulb holders.
2. Prior to the lesson, make a sample circuit to test the conductivity of the materials with which students will be working.
3. Place the items to be tested in a bag for ease of distribution.
4. Strip the ends of the wire ahead of time or let student groups do this.

## ENGAGE

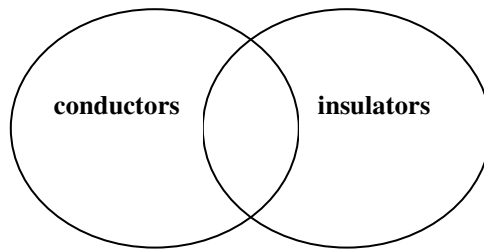
1. Ask: *Why are many wires coated with plastic or some other material?*
2. Show students an appliance or extension cord. Ask: *If this cord were not covered with this coating, what would you see?*
3. *Would it be safe to use this cord or appliance if any of the wires wrapped in the coating were exposed?*

## **EXPLORE**

1. Discuss what the terms insulator and conductor mean.
2. Distribute the materials to each group.
3. Demonstrate how to build a circuit to test the conductivity of materials using the D-cell, wire, light bulb, bulb holder and battery holder.
4. Students should predict whether or not the materials will conduct electricity and record their predictions on the activity sheet.
5. Have students place one object in the circuit and record the results.
6. Encourage students to choose additional objects to test.

## **EXPLAIN**

1. As the students share their findings, record the names of items that were insulators or conductors in a Venn diagram and have students justify their answers.



2. Ask:  
*How did the tester help you determine if an object was an insulator or a conductor?*  
*What similarities exist among the conductors?*  
*What similarities exist among the insulators?*
3. Create a Double Bubble to compare conductors and insulators.
4. Refer students to both the Double Bubble and the Venn diagram. Ask: *What is the difference between an insulator and a conductor?*  
*Did any objects act as both an insulator and a conductor? How is this possible? (Some objects, like pencils, are both, depending on what part of the object is placed in the test circuit.)*

## **EXTEND/APPLY**

Discuss electrical safety with students and brainstorm a list of safety tips for working with electrical devices. The discussion may include:

- why certain tools have plastic-covered handles
- why it is an unsafe practice to place electrical cords under carpets

## **EXTENSION**

Students should continue to test materials found in the classroom or at school and items brought from home.

## **ASSESSMENT**

Have students differentiate between a conductor and an insulator and give examples of both.

# *Insulator or Conductor?*

Conductors complete a circuit by allowing electrons to flow freely through them.  
Insulators do not.

Try to complete the circuit with each object. Record the results of each test on the table below. Then choose other objects you would like to test.

Object	Prediction	Conductor	Insulator
<b>penny</b>			
<b>brass fastener</b>			
<b>plastic</b>			
<b>pencil</b>			
<b>microscope slide</b>			