

Conductivity Testers

Overview: Today you get to wire up a simple circuit and test a variety of objects to figure out if they are insulators or conductors of electricity.

What to Learn: Take special note as to which *kinds* of materials are insulators and which are conductors of electricity. Metals are conductors not because electricity passes through them, but because they contain electrons that can move.

Materials

- 2 AA batteries
- AA battery case
- 3 alligator wires
- LEDs

Lab Time

1. It's time to wire up your detector. Here's what you need to do:
 - a. Remove one of the alligator clips from the LED (it doesn't matter which one) and let it dangle.
 - b. Add a *third* alligator clip to the LED – right in the same spot as the one you just removed. The other end should be dangling also.
 - c. Hold the circuit by the two dangling alligator clips, and touch their tips together. The LED should light up.
 - d. Break contact and the LED goes dark. Touch them together again and the LED lights up. On. Off. On. Off. On. This is the world's simplest switch.
 - e. Now touch each of the two alligator clips to either side of an object you think will conduct electricity. What did you test and what happened?

2. Fill out the data table:

Reading

Metals are conductors not because electricity passes *through* them, but because they contain electrons that can move. An insulator does not allow electrons to move.

Think of the metal wire like a hose full of water. The water can move through the hose. An insulator would be like a hose full of cement - no charge can move through it.

All metals conduct electricity: however, some metals like copper and gold conduct better than others because they have less internal resistance (which relates to how the metal is structured.) Metals have free electrons which can move from atom to atom, allowing the electricity to conduct through them. Paper, rubber, and plastics make great insulators, because sometimes you don't want electricity to flow unless you say so. We're going to talk about switches when we make our burglar alarms later on.

Exercises

1. Name six materials that are electrically conductive.
2. What kinds of materials are conductors and insulators?
3. Can you convert an insulator into a conductor? How?
4. Name four instances when insulators are a bad idea to have around.
5. When are insulators essential to have?

Answers to Exercises: Conductivity Testers

1. Name six materials that are electrically conductive. (Soda cans, quarters, paper clips, braces, unpainted eyeglasses, and your tongue.)
2. What kinds of materials are conductors and insulators? (Materials with free electrons, like metals, are conductors. Insulators are like paper, ceramics, and rubber.)
3. Can you convert an insulator into a conductor? How? (Yes, that's what a semiconductor is. It's like a switch in a black box. Sometimes it conducts and sometimes it doesn't. If it's a dimmer switch, then it conducts to different degrees depending on the position of the dimmer.)
4. Name four instances when insulators are a bad idea to have around. (When you need to conduct electricity, like to a bulb, motor, relay, buzzer, etc. Also when static charge can harm a circuit, you need a way to discharge regularly to avoid build-up.)
5. When are insulators essential to have? (When you want to turn off a light.)