

Inquiry Question

What are conductors? Insulators? Can you build a tester capable of determining a "good" versus a "bad" conductor?

Name: _____

Date: _____

A continuity tester is a device that you will find in any electrician's bag. It simply tells you a circuit is connected between two points. Even better testers will describe "how good" this connection is.

Can you build a continuity tester that is capable of describing "how good" a connection is?



General Instructions

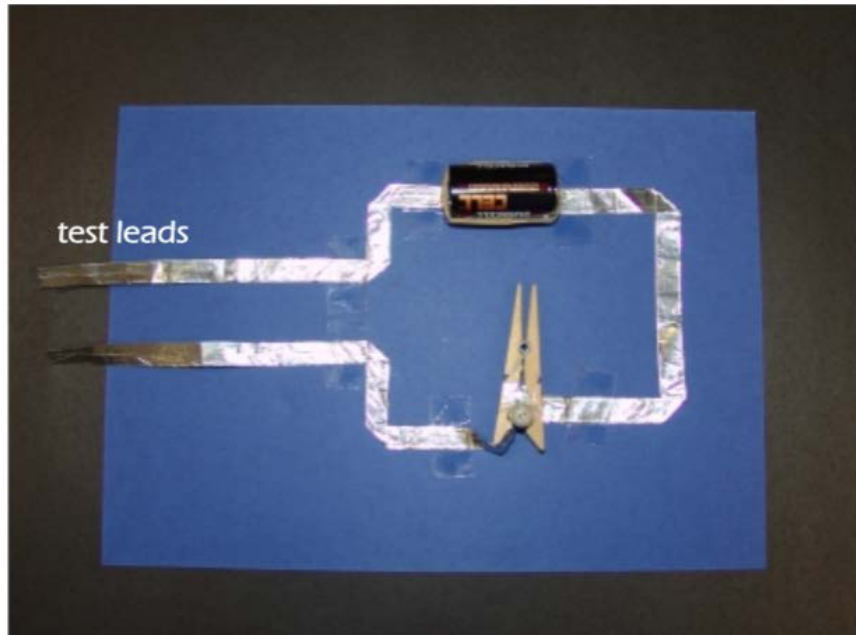
The student will be building a basic continuity tester as described below. They will then use the tester to check the conductivity of various household materials.

Materials you'll need:

- Your course notes
- The internet
- 1.5 V light bulbs (an electrical supply store or automotive parts store)
- tin foil
- glue
- cardboard
- wooden clothes peg
- thumb tacks
- tape
- scissors
- D cell 1.5 volt battery

Procedure:

- With some help, build the simple circuit below by gluing folded stripes of tin foil in the configuration shown. Make sure that the battery is connected to the tinfoil on either end by fastening the folded tinfoil to the battery with tape. Tape the battery down onto the cardboard to keep it from rolling around and tearing out your foil.



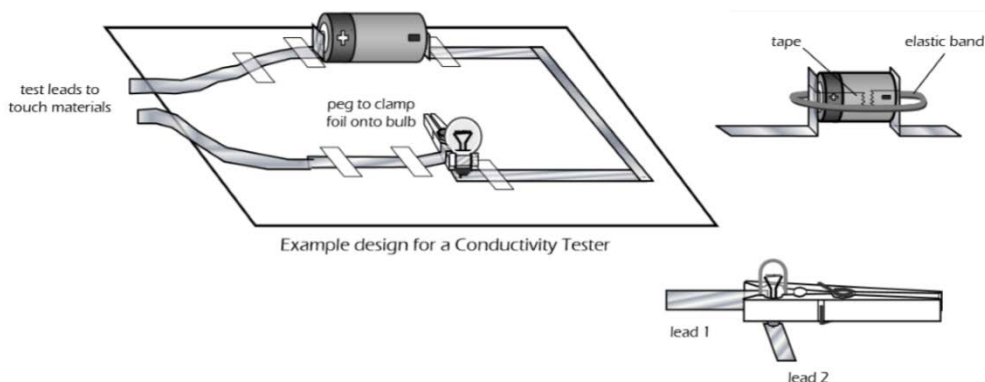
- Place your light bulb inside a clothes peg so that the bottom metal sleeve is positioned in the hole of the clothes peg.



- The "hole" of the clothes peg will be lined with the tin foil that makes a path to your conductivity test leads. The electrical contact on the base of the light bulb will then firmly rest on the other strip of tin foil that connects the clothes peg to the battery.



- Overall, your tester might have the design as shown below:



Example design for a Conductivity Tester

Conductivity Lab:

1. Create a table like the one shown below. Test for conductivity using your tester. The brighter the light bulb, the better the conductivity.
2. PREDICT - rank your materials from best to worst in terms of conductivity. Then use the tester to see if your prediction was correct (or close).

<i>Material</i>	<i>Light Bulb Brightness (prediction)</i>	<i>Light Bulb Brightness (result)</i>	<i>Is material a Conductor or an Insulator?</i>

Ideas and Hints

- a rubber band attaching the leads to the battery works well (see diagram)
- be sure that all parts of your tester are firmly fastened to the cardboard so that they stay in place when the board is tilted (for testing water)
- check that your tester works by laying a strip of tin foil across the test leads. The light bulb should glow brightly

Project submission:

- Upload your completed work to the Physics project drop box if you chose to submit online.
- You can either submit photos/video of your project (along with an explanation and/or steps of construction) or, if you can drop-in to the school, you can present it to your teacher in-person.
- Be sure to carefully organize any data collected so that any other student or teacher could reproduce your experiment and achieve the same results.

Project Timing:

- In its most basic form, this project will take the average student 2 hours. Locating all of the materials needed may vary.

Inquiry Questions and Experimental Design:

1. Rank your materials in order from best conductor to worst.
2. Were there any surprises?
3. What are the general properties of a good conductor?
4. What are the general properties of a good insulator?
5. Were there any materials that were neither a good conductor, nor a good insulator? How do you know?