

The Current Conductivity Of Various Materials

1) The Big Question

The purpose of my science project is to discover what are good and poor conductors of electricity.

2) My Hypothesis

I think metallic type materials will be good conductors of electric current and non metallic materials such as wood or plastic will be poor conductors of electricity.

3) Planning the Procedure

Description of Experiment

I will build a test circuit to test the current flow through various materials. I will build this test circuit by connecting a battery, an on/off switch, a current limiting resistor, and a milliamp meter in series with two test probes. I will connect my various test materials across the test leads and record the current meter reading on a chart. Then I will evaluate the recorded test data to determine which materials have good conductivity, some conductivity, or no conductivity.

Materials:

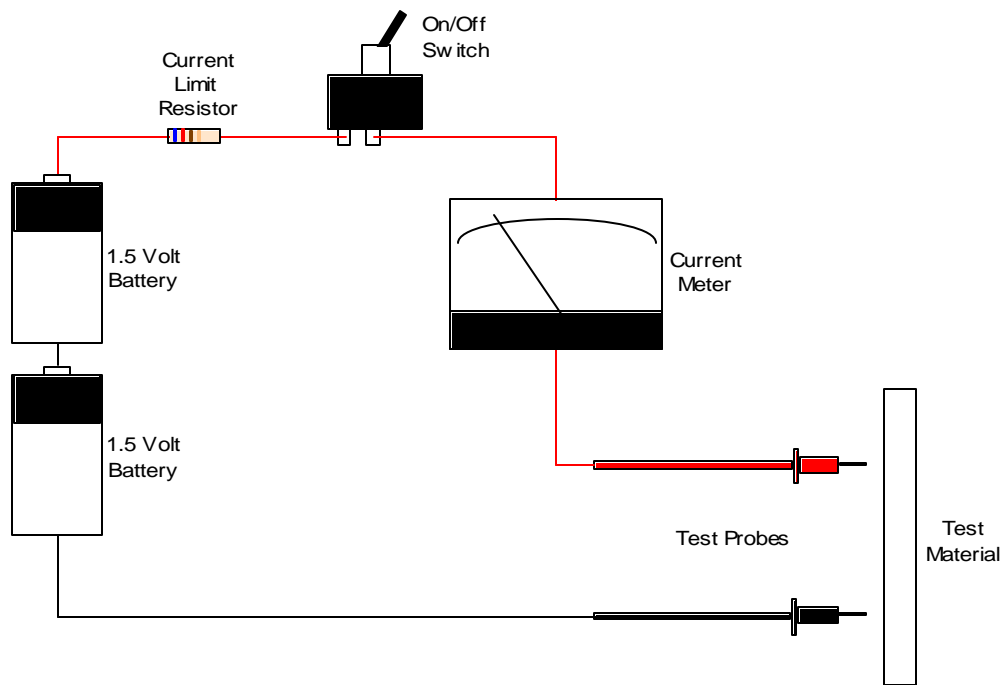
Test circuit

- 2 1.5 Volt Batteries
- 1 On/Off Switch
- 1 4.5 Milliamp Meter
- 1 620 Ohm Resister
- 2 Test Probes

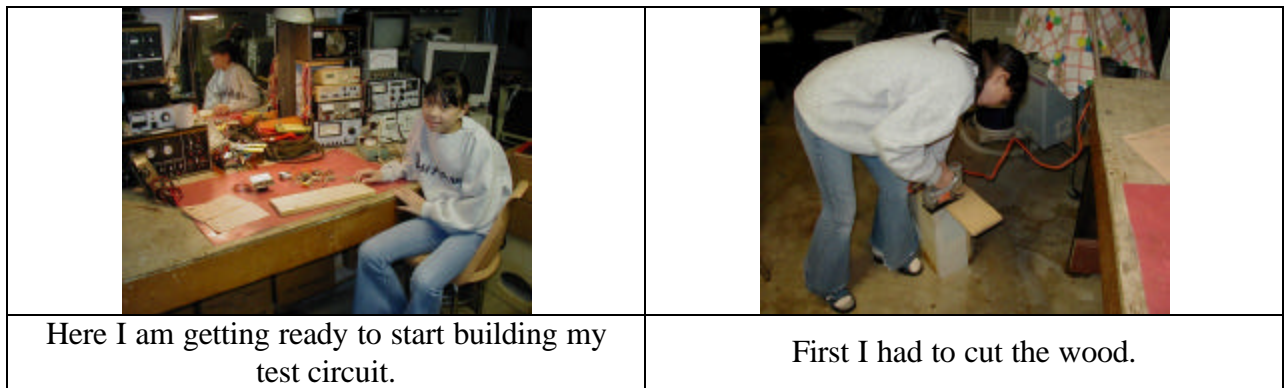
Test Materials :

- Dry Sponge
- Wet Sponge
- Plastic
- Bakelite
- Copper Wire
- Pencil lead
- Eraser
- Brass Screw
- Aluminum Nail
- Wood
- Phenylic
- Battery
- Battery with leads Switched
- Wet Finger
- Dry Finger
- Salt Water
- Regular Water

4) Building The Test Circuit



This is the test circuit my dad helped me design to measure the current flow through my test materials. The batteries provide the power to generate the current flow. The current limiter resistor limits the current flow to a safe level to prevent damaging the meter when I test very conductive materials. The on/off switch turns the test circuit on and off. The current meter shows how much current is flowing through the test material. Finally, the test probes are connected across the materials I will be testing.





Here I am Building the current limiting resistor assembly



Here I am putting the current limiting resistor assembly on the board.



Here I am putting the batteries on the board.



Here I am putting the switch on the board.



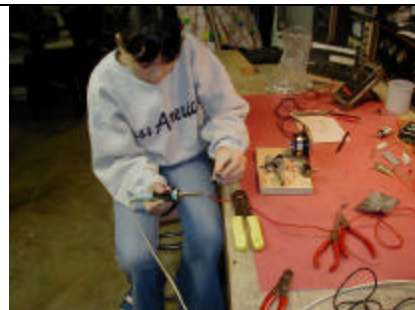
Here I am putting the meter on the board



Here I am testing the current limiting resistor with a volt-ohm meter.



Here I am soldering the wire connections.



More soldering

5) Test Results

Once I completed building my test circuit, I started testing the conductivity of my test materials and recording the results on a table.



These are my test results for the different materials I tested.

Test Results

Material	Current Flow	Conclusion
Lead Shorted	4.31 ma.	Control Reference
Dry Sponge	0 ma.	Not Conductive
Wet sponge	.183 ma.	Some Conductivity
Plastic	0 ma.	Not Conductive
Bakelite	0 ma.	Not Conductive
Copper wire	4.31 ma.	Very Conductive
Pencil lead	4.066 ma.	Some Conductivity
Eraser	0 ma.	Not Conductive
Brass screw	4.31 ma.	Very Conductive
Aluminum Nail	4.31 ma.	Very Conductive
Wood	0 ma.	Not Conductive
Phenyllic	0 ma.	Not Conductive
Battery	2.155 ma.	Some Conductivity
Battery with leads switched	4.6 ma. (Pegged Meter)	Extremely Conductive
Wet Finger	.424 ma.	Some Conductivity
Dry Finger	0 ma.	Not Conductive
Salt Water	1.774 ma.	Some Conductivity
Regular Water	.244 ma.	Some Conductivity

Then I regrouped my test results into categories which had common results.

Very Conductive Materials

Material	Current Flow	Conclusion
Copper wire	4.31 ma.	Very Conductive
Brass screw	4.31 ma.	Very Conductive
Aluminum Nail	4.31 ma.	Very Conductive
Battery with leads switched	4.6 ma. (Pegged Meter)	Extremely Conductive

Some Conductivity Materials

Material	Current Flow	Conclusion
Wet sponge	.183 ma.	Some Conductivity
Pencil lead	4.066 ma.	Some Conductivity
Battery	2.155 ma.	Some Conductivity
Wet Finger	.424 ma.	Some Conductivity
Salt Water	1.774 ma.	Some Conductivity
Regular Water	.244 ma.	Some Conductivity

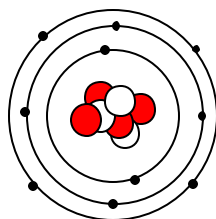
Non Conductive Materials

Material	Current Flow	Conclusion
Dry Sponge	0 ma.	Not Conductive
Plastic	0 ma.	Not Conductive
Bakelite	0 ma.	Not Conductive
Eraser	0 ma.	Not Conductive
Wood	0 ma.	Not Conductive
Phenyllic	0 ma.	Not Conductive
Dry Finger	0 ma.	Not Conductive

6) Conclusion

My conclusion is that in general metallic materials are very conductive. Non metallic materials are non conductive. I also discovered that some materials have some conductivity that is less than the conductivity of metals but more conductive than non conductive materials.

To understand the conductivity of different materials I had to first learn what is electric current flow. My dad and I researched electricity at the library. I learned that electric current flow is actually the flow of electrons of an atom.



All materials are made up of atoms. An atom is made up of a nucleus. The nucleus is made up of protons and neutrons. Circling around the nucleus are smaller particles called electrons. Different materials are made up of atoms which have different numbers of protons in their nucleus and electrons circling the nucleus. Electric current flow is created when an electron can be removed from an atoms outer orbit, it then becomes free of its bond to the atom and can

