



## Simple Portable Conductivity meter

Make a qualitative conductivity meter with a battery, bulb and foil.


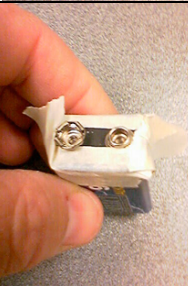
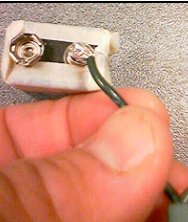

### Materials:


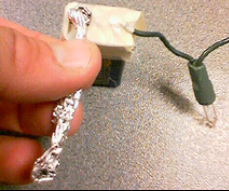

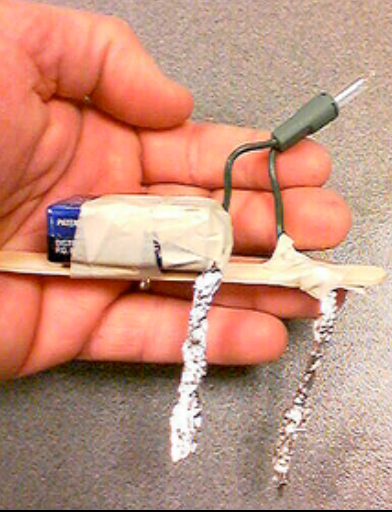

- Christmas lights
- Aluminum foil
- 9V battery
- Popsicle/ craft stick or plastic knife
- Wire strippers or scissors
- Tape
- Cups



- Water
- Salt or other ionic solution to test
- Optional: Stainless steel wire instead of Aluminum foil

### Assembly:

<p>1. Cut off individual lights and expose the interior wire. Wires should trail at least 2 inches or 5 centimeters from base of bulb.</p>	
<p>2. Place tape around the top edge of the 9-volt battery. This will help reduce the chances of short-circuiting the battery by insulating the metal outer battery casing. Also, if you cover the terminal polarities, make a note of which is + or - .</p>	
<p>3. Make a small wad of foil around one of the exposed wires from the light bulb.</p>	
<p>4. Place the wad and wire into the positive terminal of the 9-volt battery.</p>	
<p>5. Secure and cover over the wad and wire with tape.</p>	

<p>6. Roll aluminum foil into two tubes. These will be your leads to test the conductivity of a solution. Stainless steel wire can be use instead of Aluminum foil to prevent corrosion and reactions with tested solutions.</p>	
<p>7. Place one of the aluminum leads into the negative battery terminal and place tape over it.</p>	
<p>8. Wrap the other aluminum lead around the exposed wire from the bulb.</p>	
<p>9. Tape the whole thing down to the popsicle/craft stick as shown.</p> <ol style="list-style-type: none"> <li>Secure the battery to the stick.</li> <li>Tape the aluminum leads so that they will not detach from the battery or the end of the light bulb.</li> <li>Allow the leads to dangle from the stick.</li> <li>Leave some stick exposed at both end of the device. This will enable the device to "sit" on top of the solution containers (see intro picture above).</li> </ol>	
<p>10. Test your device to ensure that it works properly. Do this by touching the aluminum leads together. The bulb should light. Separate the leads....your device is ready!</p> <p>Note: Don't let the bulb burn too long with direct current from the 9-volt battery. It will burn out the bulb.</p>	

### To do and notice:

Important note:

Gas may appear at leads as well as decomposition of aluminum. This signifies a chemical reaction at the leads.

To test if a solution conducts electrical currents.

1. Fill a cup with solution.
2. Rest the device on the rim of the container.
3. Make sure the aluminum leads are in contact with the solution.
4. If the light, lights a lot, the solution is very conductive. If it glows little to none, your solutions is not so conductive.

To test a series of solutions (or solutions with varying concentrations of electrolytes):

1. Fill each container to the same height.
2. Rest the device on the rim of each container.
3. Check to make sure the leads are immersed in the solutions at the same depth. This will keep the contact area the same for each solution tested.

Test to see if a solution will electro-plate:

1. Fill a container with a solution.
2. Place your device on the rim of the container.
3. Watch the leads and see what develops.
4. If a color change happened at one of the leads you have electroplating happening.



This solution is Copper Sulfate.  
Copper plates on the negative lead.  
Note the blacken or copper coated lead on the left.

### What's going on?

If your solution lights the bulb, it is said to contain Electrolytes.

Electrolytes are charged particles, usually ions in solution. These ions come in positive and negative charges. Ions are attracted to their correspondingly oppositely charged lead. This means that positively charged particles move and are attracted to the negative aluminum lead and negatively charged particles move and are attracted to the positive aluminum lead. This flow of charged particles completes the circuit. This allows the light to light.

