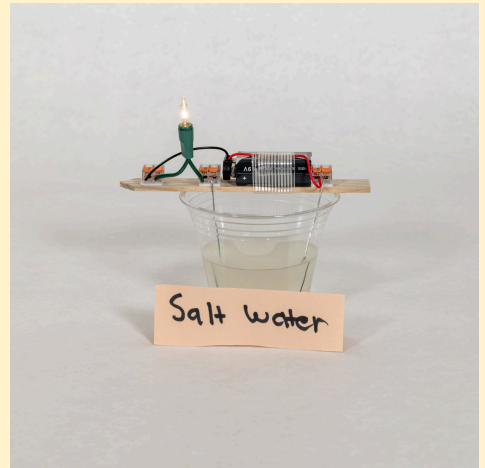
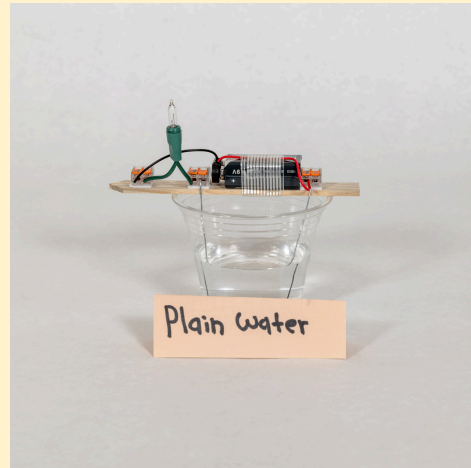




How To Build A Conductivity Meter

A conductivity meter is a tool that allows you to test how well a solution conducts electricity. In this guide, we will provide step-by-step instructions to build a simple and durable conductivity meter using common tools and supplies.



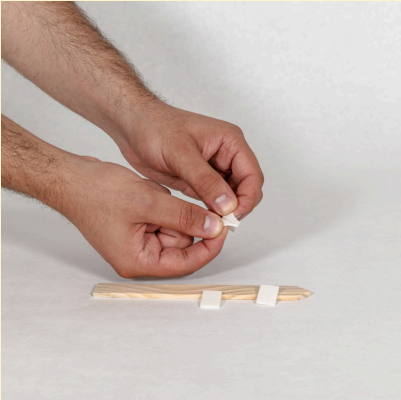
Tools and Supplies



- String of holiday lights
- Wire strippers/cutters
- Wooden stakes
- Lever nuts
- Paper clips
- 9V battery
- 9V battery connectors
- Double-sided mounting tabs
- Strapping tape (or other strong tape)



Prepare The Base



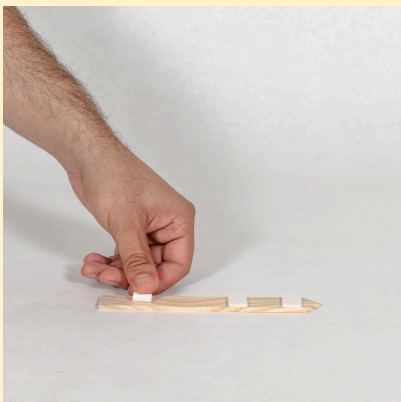
Place your wooden stake on a flat surface. Get your mounting tabs ready by unsticking one side from each tab.



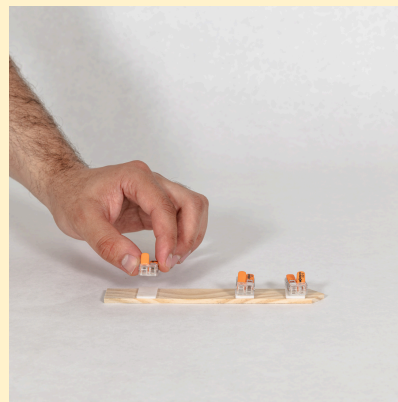
Place your first mounting tab at the base of the wooden stake's tip, making a triangle shape. Firmly press it onto the stake.



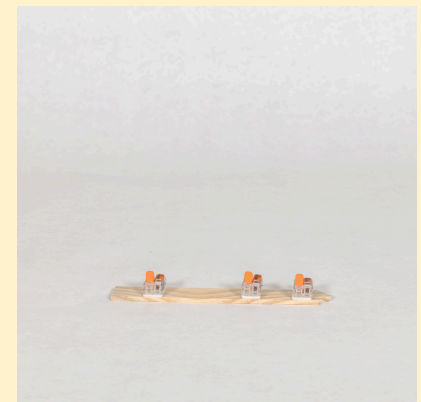
Place your second mounting tab about one finger width below your first tab.



Place your third mounting tab about one finger width above the bottom of the stake.



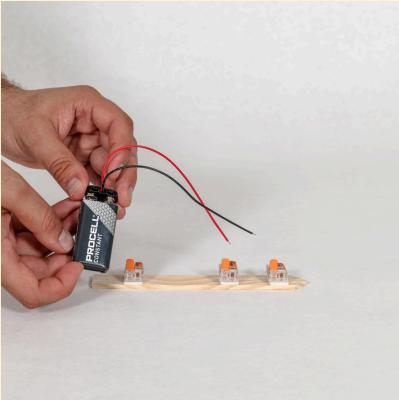
Remove the other adhesive covers on your mounting tabs. Take 3 lever nuts and secure them to each mounting tab.



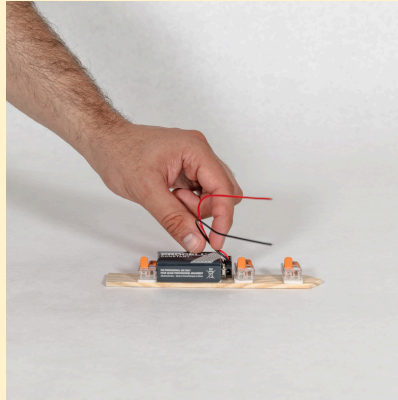
Make sure the lever nuts are all facing the same direction. Your completed base should look like this.



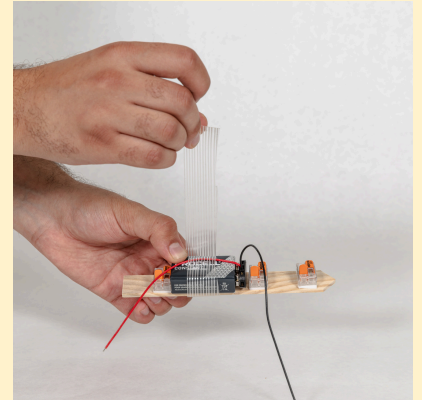
Attach The Battery



Take a 9V battery and secure the 9V connector to the top of the battery.

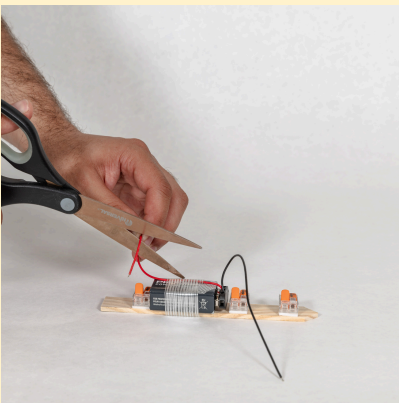


Place the battery and connector onto the base. Make sure the wires from the battery connector are facing upwards.

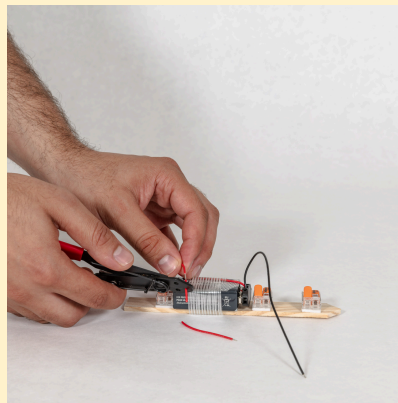


There should be a small gap of space between the top of the battery/connector and the middle tab. Tape your battery to the wooden stake.

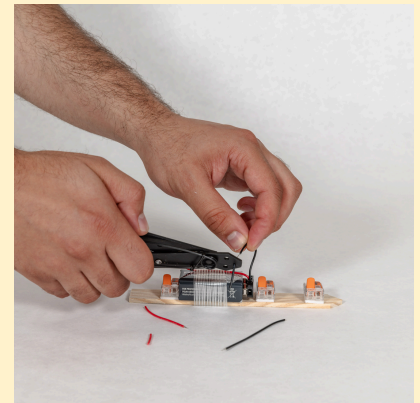
Prepare The Wires



Measure the amount of wire needed to reach the top and bottom lever nuts. Shorten the wires, if needed, to remove any excess wire.



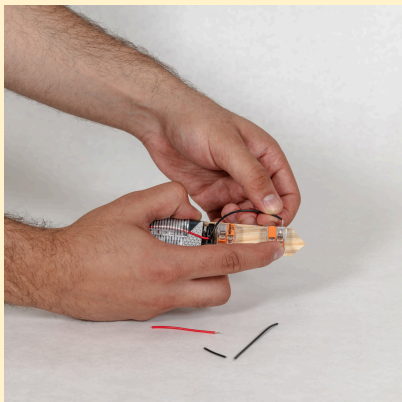
Use a wire stripper to remove the plastic coating from the red wire. Expose about half an inch of wire.



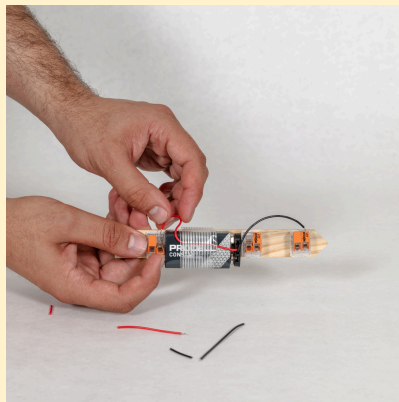
Repeat this process with the black wire. You can twist the exposed wire with your fingers if it becomes frayed.



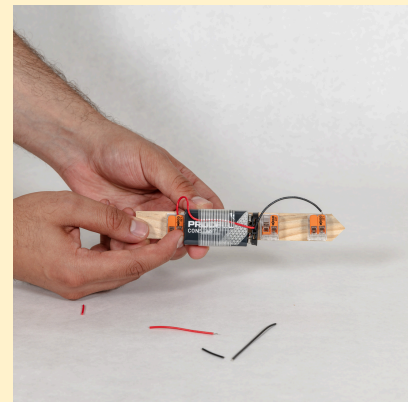
Secure The Connection



Take the black wire and secure it inside the top lever nut. Use the opening closest to the tip of the wooden stake.

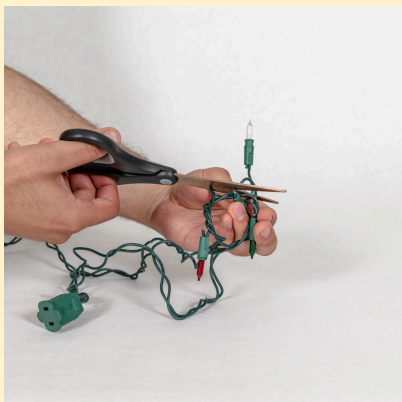


Take the red wire and secure it inside the bottom lever nut. Use the opening closest to the bottom of the wooden stake.

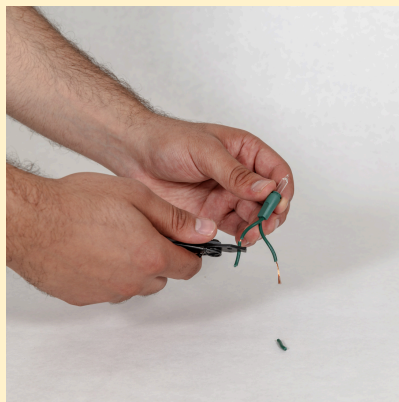


Make sure to close both lever nuts to secure your connection.

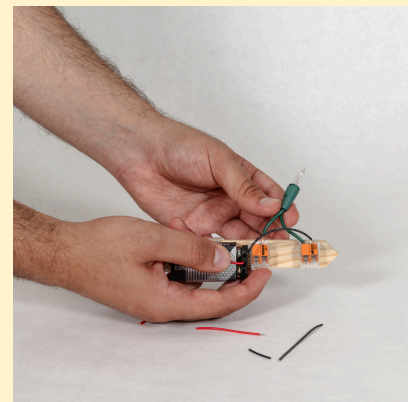
Attach The Light Bulb



From a string of holiday lights, cut off one bulb. Leave as much wire on both sides as you can.



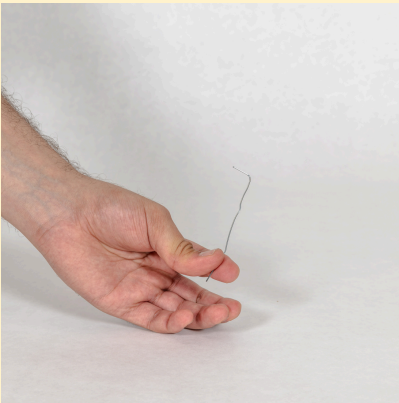
Use a wire stripper to remove the plastic coating. Expose about half an inch of wire on both sides.



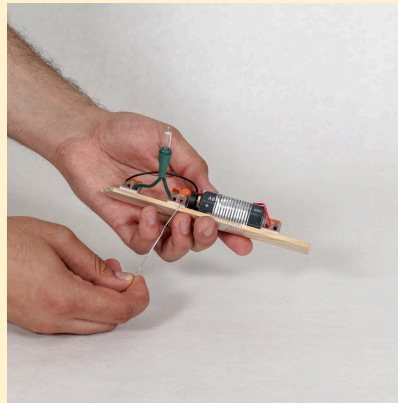
Secure one bulb wire into the top lever nut. Secure the other bulb wire into the middle lever nut. Close both lever nuts to secure the connection.



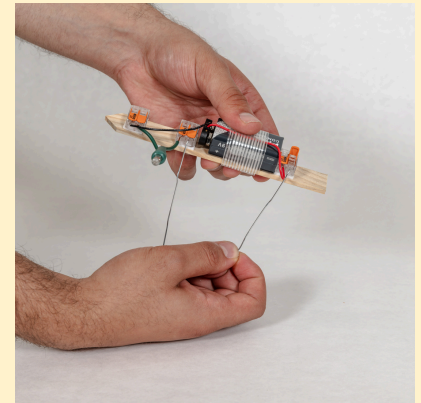
Attach The Paperclips



Take two paper clips and uncurl them. Leave a short 90-degree bend at one end.



Insert the paperclips into the remaining lever nut openings, on either side of the battery.

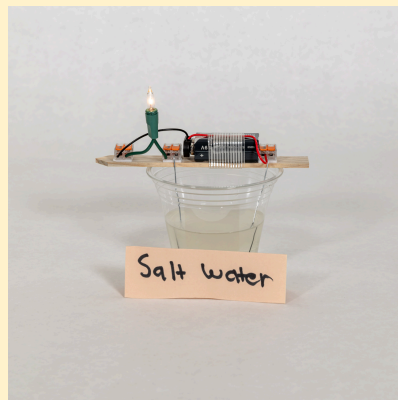


Close the lever nuts to secure the paper clips. You now have a working conductivity meter.

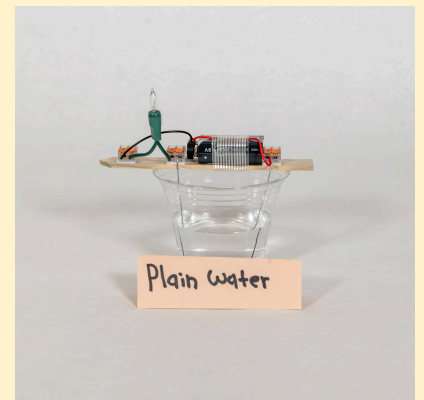
Test Your Conductivity Meter



Prepare two cups or small beakers. Add plain water to one of your containers and add salt water to the other.



Place your conductivity meter onto the cup's rim to submerge the paper clips in solution. Make sure that the paper clips do not touch underwater.



If your device is working properly, the bulb should light up in the saltwater solution. The bulb should remain off in the plain water solution.

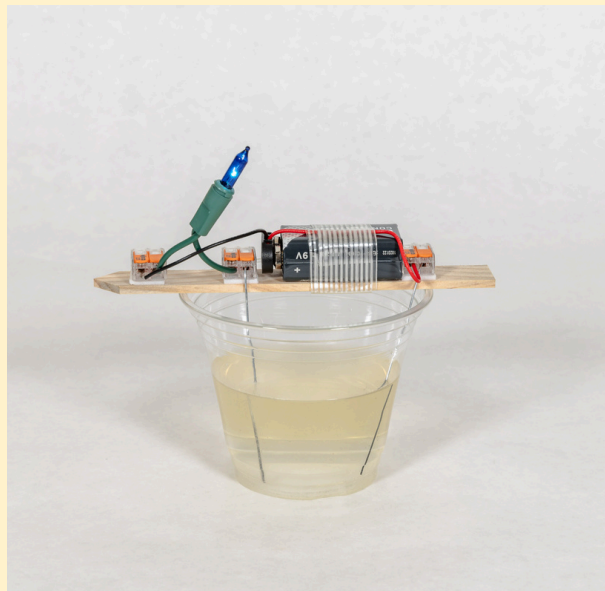


Things To Try

Fill several cups to the same height with solutions containing varying amounts of salt. Compare how the light bulb glows in each of the different salt solutions.

Try substances other than salt. Compare how the light bulb glows (or doesn't) in different solutions.

A white light makes it easier to see results. However, colorful lights can also be fun! Feel free to try different colors of holiday lights.



Whats Going On

The salt molecule (NaCl) is held together by ionic bonds. Ionic bonds are weak chemical bonds that break apart in water. The result is two slightly charged ions: Sodium (Na^+) and Chloride (Cl^-).

In solution, these ions move toward their opposite charges. This movement of ions completes the circuit in your conductivity meter, causing the bulb to light up. The more ions in solution, the brighter the bulb will become.

As the ions move, they can also create interesting chemical changes. You might notice the formation of bubbles, changes to the color of the paper clips, or alterations in the color and pH of the liquid.

