

VINEGAR BATTERY



VINEGAR BATTERY, SIDE VIEW

YOU WILL NEED:

- Small Styrofoam, Plastic, or Glass Cup
- Distilled White Vinegar
- Copper Wire
- Galvanized Screws or Galvanized Nails
- Masking Tape
- Wire Strippers
- Small LED Bulb
- Multimeter
- Alligator Clips



MATERIALS, IN ORDER LISTED ABOVE

STEP-BY-STEP INSTRUCTIONS TO CREATE A VINEGAR BATTERY

1. Cut a piece of copper wire. The wire should be approximately 4 inches in length.
2. Strip wire so there is only bare copper exposed.
3. Pour vinegar into cup until it is approximately $\frac{3}{4}$ full.
4. Place a strip of masking tape across the top of the cup.
5. Bend copper wire so that the wire makes an L-shape (small leg should be about 1 inch in length).
6. Poke the wire into the masking tape strip so that it makes an upside down L; make sure the copper wire is partially submerged in vinegar.
7. Poke galvanized screw or nail into the masking tape strip; make sure the screw or nail is partially submerged in vinegar.
8. You now have a Vinegar Battery!

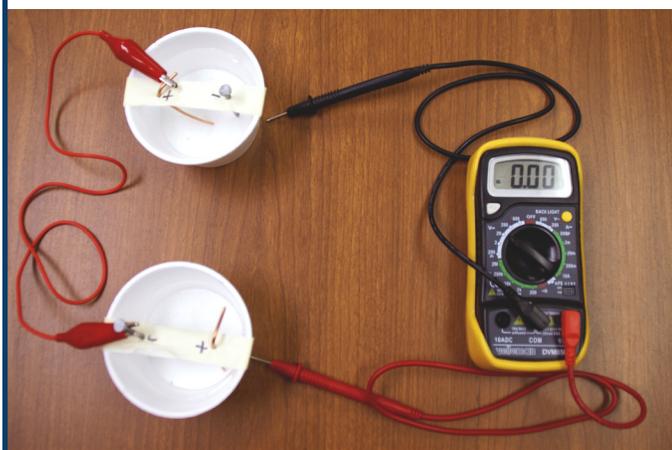
TEST YOUR BATTERY...

To test your vinegar battery, you can check the voltage across the battery using the multimeter. The **red**, or **positive**, end of the multimeter should touch the **copper wire**, which is the **positive terminal** of the battery. The **black**, or **negative**, end of the multimeter should touch the **galvanized screw or nail head**, which is the **negative terminal** of the battery. You should then be able to read the voltage drop across the two terminals (*Hint: The voltage drop should be approximately 0.8-1.0 Volts*).

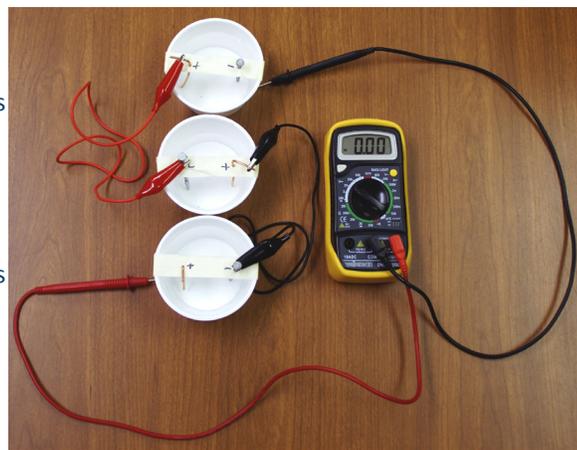


BATTERIES IN SERIES...

Create a second battery and wire the batteries in series. Wire the **positive terminal** of one battery to the **negative terminal** of the second battery. Use the multimeter to measure the voltage of the two batteries touching the two remaining unwired terminals. How does this voltage compare to the single battery? What happens if you add a third battery?



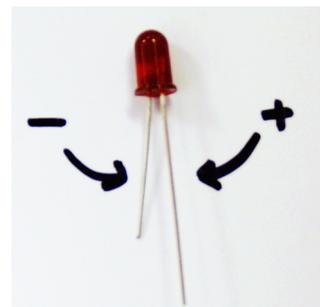
(LEFT): TWO VINEGAR BATTERIES WIRED IN SERIES, SIDE VIEW



(RIGHT): THREE VINEGAR BATTERIES WIRED IN SERIES, TOP VIEW

COMPLETE THE CIRCUIT...

To light the LED bulb connect the **positive end** of the LED to the **copper terminal** and the **negative end** to the **nail or screw terminal**. Next use your battery to power the calculator.



LEARN MORE!

- Arbor Scientific's Cool Stuff Newsletter: www.arborsci.com/cool/electricity-part-ii-getting-connected
- Exploratorium's pickle battery activity: www.exploratorium.edu/cooking/pickles/activity-kosher_dill.html
- 4-H Fruit Batteries Activity: 4h.uwex.edu/set/documents/Fruit_Batteries_update.doc
- Passport to Chemistry Adventure at Mount Holyoke College - Potato Battery: www.mtholyoke.edu/courses/magomez/ChemistryPassport/List_of_K-2_Kits_files/Electrochem.pdf
- Q & A regarding Fruit Batteries from the UIUC Physics Van: van.physics.illinois.edu/qa/listing.php?id=2390
- Science Online YouTube channel - Vinegar Battery: http://youtu.be/V_P27iln1Qk