

Coin Battery Lab

Objective: Students will construct a battery and investigate its ability to power different lights and electronics.

Question: Can we make a battery out of simple household objects?

Materials: Seven pennies, six zinc washers, one index card, vinegar, salt, one LED light, one holiday (non-LED light), dixie cup, two pieces of wire, paper towel.

Background: In this lab we will investigate what a battery is, how it works, how to make one and the limiting factors when constructing a battery. The very first battery was invented in 1800 by Alessandro Volta, an Italian physicist and is called the Voltaic pile. The Voltaic pile is a stack of disks, made from 3 different materials. Some of the disks are made from copper, some from zinc. There were also disks made from leather but we will use index cards instead. These leather disks were soaked, with an acidic solution called an electrolyte. An electrolyte is a chemical compound that dissociates (breaks apart) into ions (a charged atom or molecule) and is capable of transporting electric charge. When arranged in a specific order, a chemical reaction occurs that allows for the flow of electrons between the two metal disks. This flow between the two disks causes the copper to have a positive charge and the zinc disks to have a negative charge. The difference in charge between these two metals naturally wants to balance or return to normal. This potential energy is referred to as voltage and allows for electrons to flow between these two points when connected through a circuit. This flow of electrons when running from one end of the battery to the other is called current and is a measure of how many electrons are moving.

Procedure:

Step 1: Build your battery.

1. Measure about a quarter teaspoon of salt into a half full cup of vinegar and stir until mixed.
2. Carefully cut 18 squares the size of a penny from the index card and soak them in the solution (electrolyte).
3. Begin stacking your pennies to make your first voltaic cell.
 - a. First, stack a penny.
 - b. On top of the penny, stack three pieces of soaked index card (card should be wet not dripping).
 - c. Put a washer on top. This is one complete cell.
4. Make **2** more cells by following the procedure in step 3.
5. Stack all **3** cells on top of each other to make a voltaic pile (make sure there is no excess solution and that the layers are not touching any other layer than those directly above and below them.).

Step 2: Test your battery.

1. Use your **LED light** to test whether your battery is working.
2. Attach one wire to the exposed penny on one end. This is your battery's cathode (+ end).
3. Attach the other wire to the exposed zinc washer on the other end. This is your anode (- end).
4. Remember that current (the flow of electrons) is only moving in one direction so your light will only work if its wires are connected in one of the two ways possible.

Is your battery working? _____ How bright is your light? _____

Step 3: Test your battery doubled in size.

1. Add three more cells to your battery with your remaining materials.
2. Re-test your **LED light**.

Is your battery working? _____ How bright is your light? _____

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