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How to make a lemon battery

Ages: 10+

You will need: 4 juicy lemons, 4 copper pennies, 4 large paperclips, 5 alligator clips, 1 red LED, small kitchen knife

Introduction: In 1800, Alessandro Volta invented the "voltaic pile," which was the first electric battery. This battery was made out of alternating plates of zinc and copper, with pieces of cardboard wetted in a saline (salt) solution. He showed that when metals and chemicals come into contact, they can produce electricity!

Making a battery: Did you know you can get electricity out of a lemon, the same way Volta did? We can make a mini-battery out of a lemon, a copper penny and a paperclip. Make sure to check with a grown-up before you begin this experiment. Take a lemon, and roll it back and forth on a table. This will loosen the pulp inside and get the juices flowing inside of the lemon. With a kitchen knife, make two small cuts in the top of the lemon, about an inch or closer to each other. Be careful when cutting! Press the paperclip into one cut and the penny into the other. Make sure that the penny and the paperclip do not touch each other. Now you have created a single-cell battery! The paperclip and the penny are called electrodes, and the lemon juice is the electrolyte. The steel of the paperclip and the copper of the penny create different chemical reactions with the acid in lemon juice. These two chemical reactions cause the electrons in the lemon juice to start flowing. This is a small electrical current that we can use to power things!

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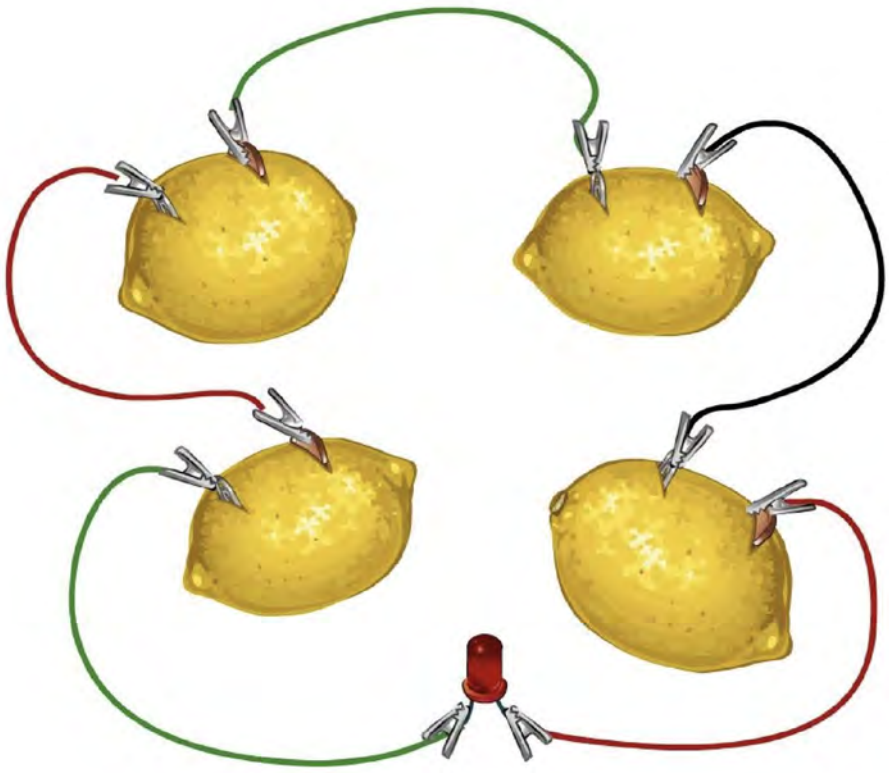
Making a circuit: One lemon battery does not produce much voltage. 1 lemon battery produces less than 1 volt, which drops in a short amount of time. If we want to produce enough voltage to light our LED, we need at least 2 volts or more. We can connect more lemon batteries in a circuit, to get more voltage.

Make 4 lemon batteries out of 4 lemons, 4 paperclips and 4 pennies. Connect each lemon battery with another lemon battery by clipping one end of an alligator clip to a penny and the other to a paperclip (see the image below). The electrons will flow from the - ends to the + ends of the lemon batteries. Then add the LED to the circuit. Make sure that you connect the - end of the LED to the + end of a battery. The - end of the LED will have one side that is flatter than the other.

With 4 lemon batteries, you should be able to make the LED shine!



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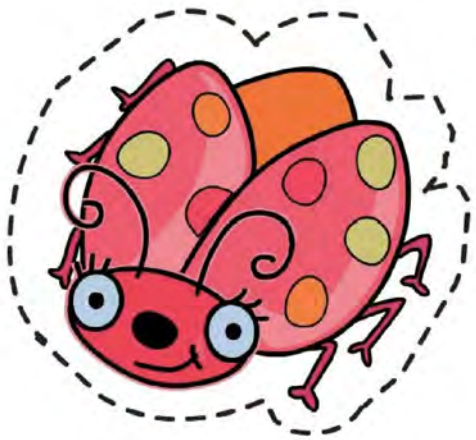
Lemon battery science fair project

Ages: 10+
You will need: 1 lemon battery circuit, 1 yellow or red LED, scissors

Instructions: Print out this page on card stock paper, and cut out the ladybug or the lamp image. Cut a hole for the LED where the black circle is. Hook up a red LED for the ladybug and a yellow LED for the lightbulb to the lemon battery circuit. Push the LED through the hole. Unclip one of the alligator clips to a lemon battery to turn the LED ON and OFF. Use red or yellow alligator clips to match.

Tips: For your report, use a voltmeter to record the voltages in your circuit. Try making circuits with more lemons and measuring the voltage. Try using other fruits or vegetables instead of lemons.

Don't use all the current up before your display. Only light the LED briefly, to show visitors.



You can bend the legs of the LED outward so there is more space for the alligator clips.

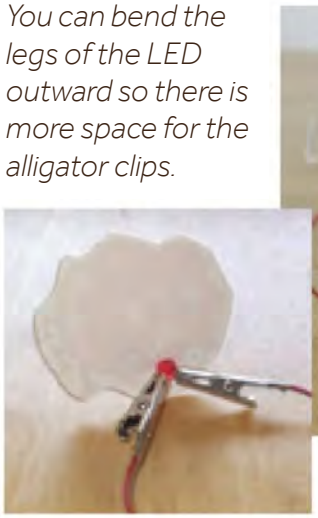


Fig. 1 Lemon Ladybug setup, front and back