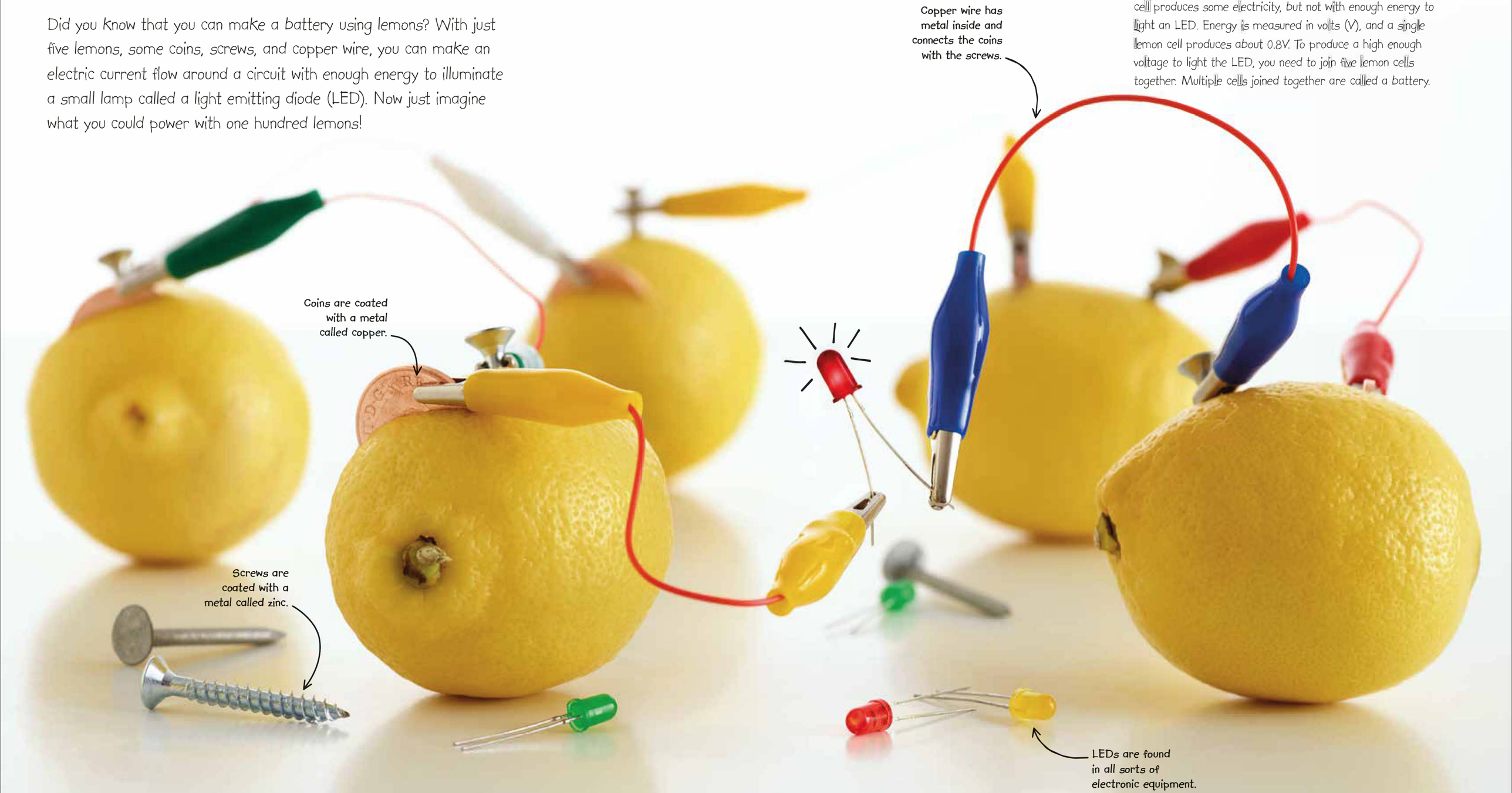
LEMON BATTERY

Did you know that you can make a battery using lemons? With just five lemons, some coins, screws, and copper wire, you can make an electric current flow around a circuit with enough energy to illuminate a small lamp called a light emitting diode (LED). Now just imagine what you could power with one hundred lemons!

CELLS, VOLTAGE, AND BATTERIES

One lemon with a coin and a screw in it is one "cell." A single cell produces some electricity, but not with enough energy to light an LED. Energy is measured in volts (V), and a single lemon cell produces about 0.8V. To produce a high enough voltage to light the LED, you need to join five lemon cells together. Multiple cells joined together are called a battery.

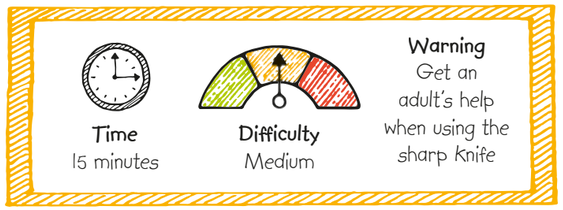


Content from *Maker Lab* from DK.

HOW TO MAKE A

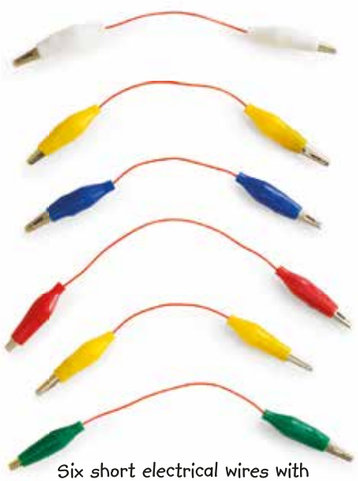
LEMON BATTERY

Ask an adult to help you get what you need. The screws must be galvanized, which means coated with zinc. LEDs and copper wire with clips can be found in craft or electronics stores. While this experiment is safe, do remember that electricity can be dangerous. And discard the lemons when you have finished the experiment—don't use them for food.



WHAT YOU NEED

Five lemons



Six short electrical wires with clips at each end

Five copper coins

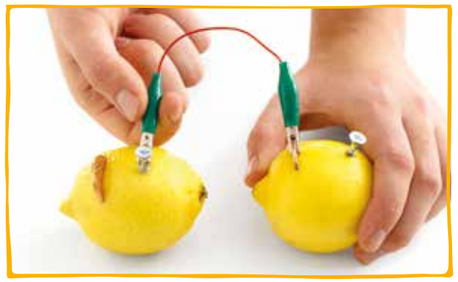
Sharp knife

Five galvanized screws

LEDs (at least one color)

1 With an adult's help, use the knife to make a cut in a lemon, about ½in (1cm) from the center, and roughly ¾in (2cm) deep. Now push a coin firmly into the slit you have created. Do the same with the other four lemons.

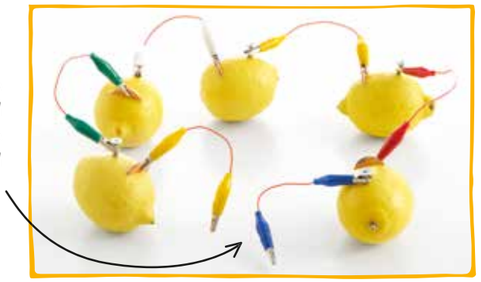
2 About ½in (1cm) from the center of the first lemon—on the other side to the coin—insert a galvanized screw. Twist it in, clockwise, to secure it in the lemon's flesh. Now repeat with the other four lemons, then arrange the lemons in a circle.



3 Squeeze the clip on one wire so that it opens, like a crocodile's jaws. Place it around the screw in one lemon, so it grips it. Connect the other clip to the coin in another lemon.

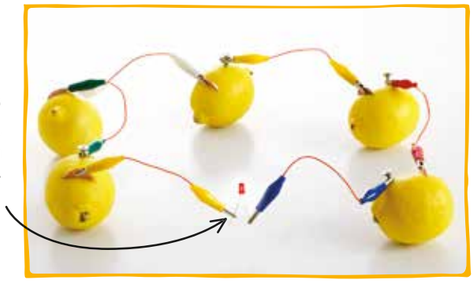
5 Each LED has two legs, which are slightly different lengths. With the free end of the wire that is attached to the coin, fix the clip to the slightly longer leg of the LED.

The wires from the first and last lemons both have one end unconnected.



4 Connect all the lemons—coin to screw—as in step 3. For the last lemon, attach a wire to its coin, but don't connect it to the screw in your first lemon. Instead, attach another wire to that screw.

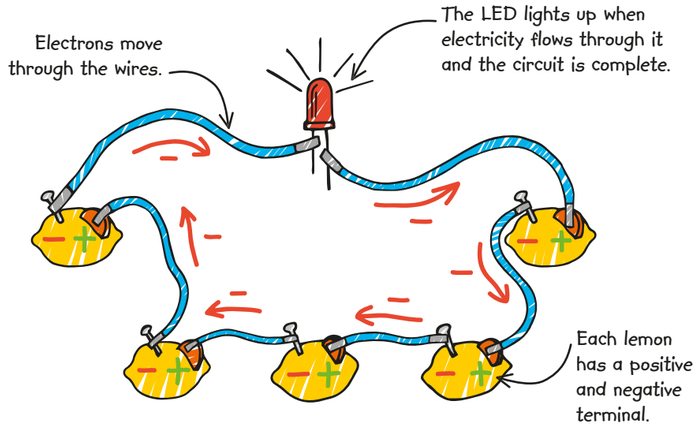
If the light from the LED is weak, try pushing in or wiggling the screws and coins.



6 Now connect the clip of the other free wire that is connected to the screw to the other, shorter leg of the LED. This now completes the circuit to make the LED light up.

HOW IT WORKS

The electric current that lights your LED is actually caused by countless tiny particles called electrons moving around the circuit. Electrons are present inside every atom. As the zinc dissolves in the lemon juice, two electrons are released from each atom of zinc (from the screw). All electrons are negatively charged, and they push apart as they move inside the wire. When they reach the copper coin, they take part in another chemical reaction, allowing electrons to continue flowing around the circuit.



Content from *Maker Lab* from DK.