

## Section 3

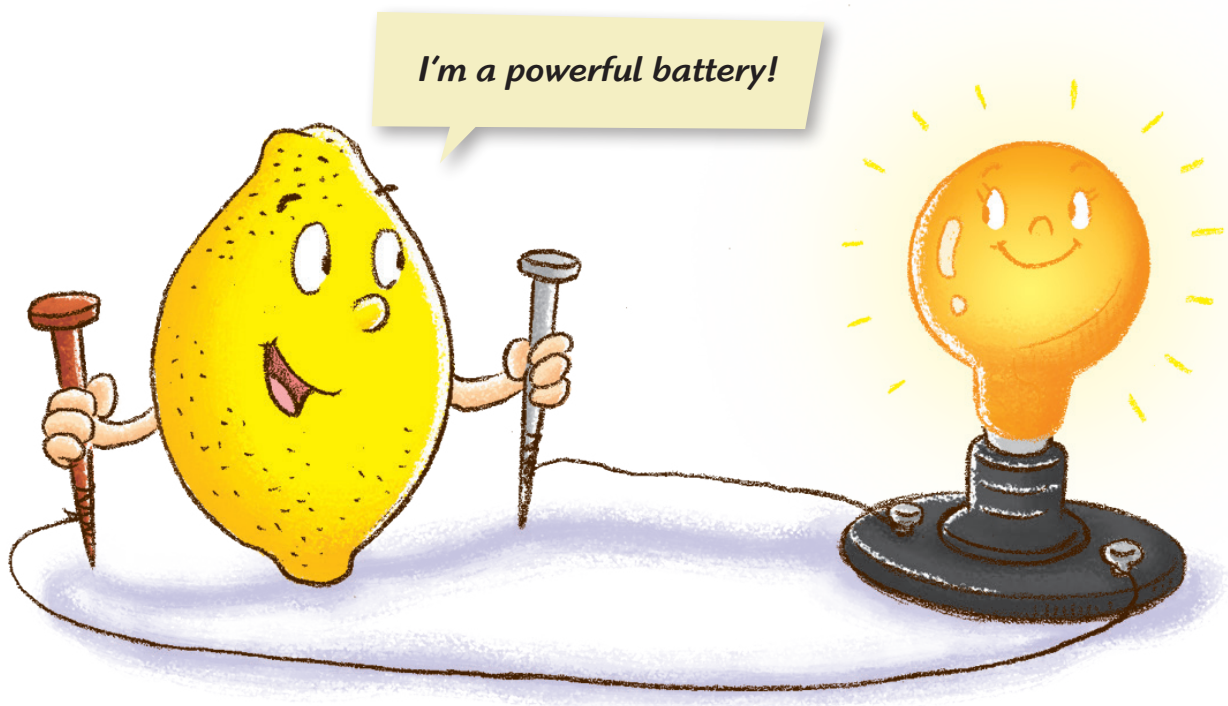
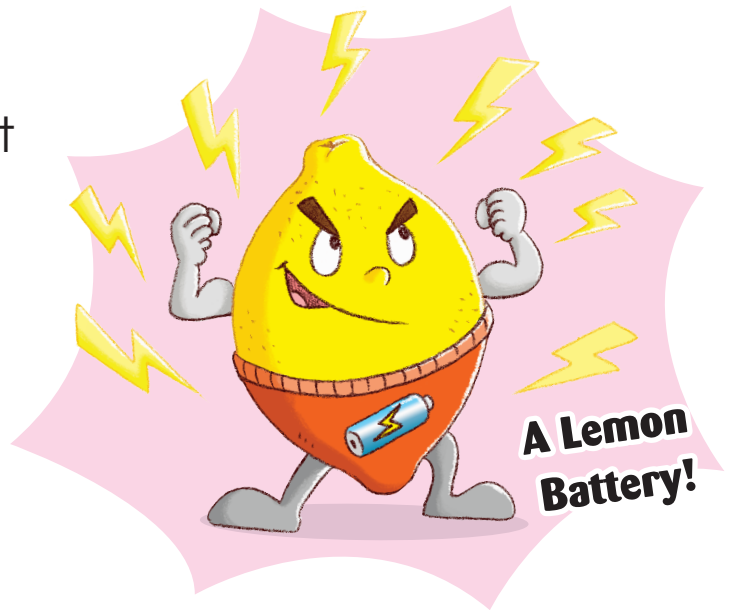
### Understanding Matter and Energy

#### EXPLORATION 2

## Make a lemon battery!

Learn how batteries work.

Batteries come in different sizes and types. They work in more or less the same way to provide portable and convenient sources of energy for powering our toys and small devices. A battery is a jar of chemicals. Once the chemicals react with one another, they produce electricity to power our devices. But did you know that lemons can also generate electricity like batteries? Try this experiment to discover how.





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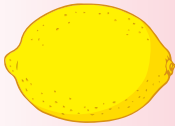
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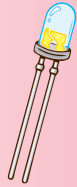
## Make a lemon battery!

Try this experiment to learn about the components of a battery and how a battery works. (Adult supervision is required for this experiment.)

### Materials:



a lemon



a small LED  
light bulb



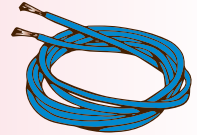
a zinc  
nail



a copper  
nail




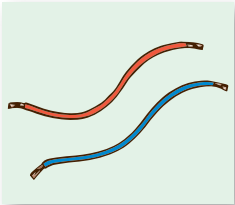
electrical  
tape

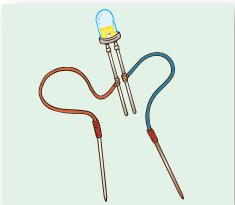


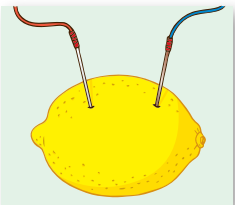
wire (or  
an old USB  
cable)

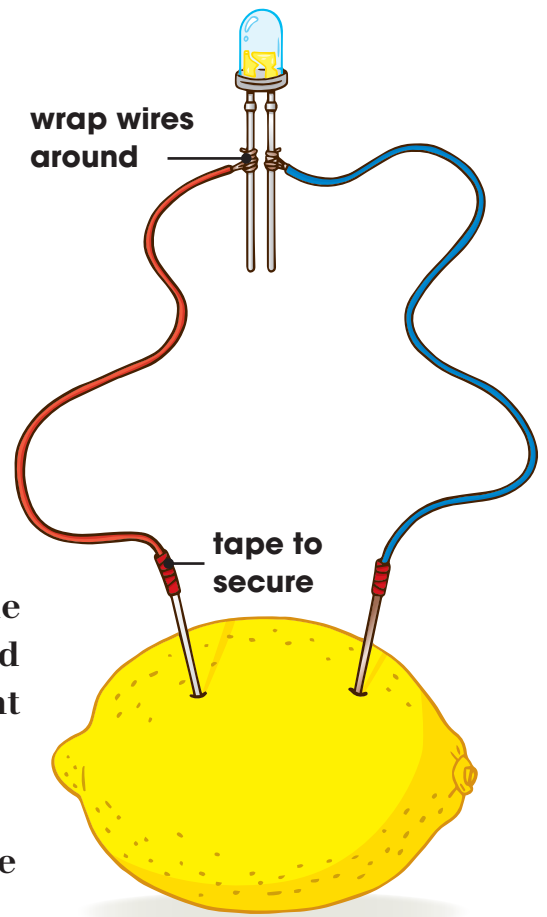
### Steps:

1.  Without breaking its skin, roll the lemon between your hand and a table to release some of the juice inside.

2.  Cut out two 15-cm-long wire pieces. Then remove 3 cm of plastic coating from the ends of the wires.

3.  Connect the zinc nail and the light bulb with one wire, and the copper nail and the light bulb with the other wire.

4.  Insert the nails deep into the lemon. Make sure they are not touching and you are not holding any metal parts. Observe the light bulb.





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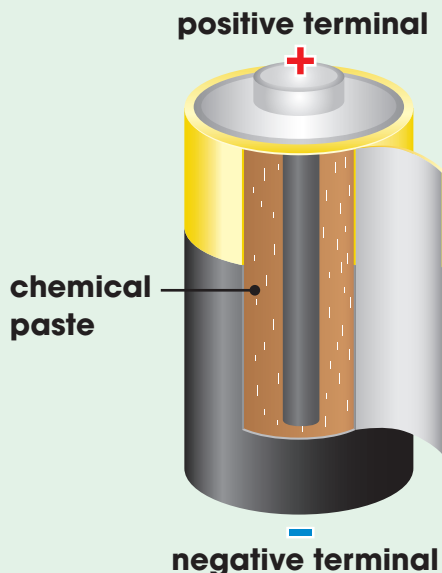
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When the setup was complete, the light bulb should have lit up because it was being powered by the lemon battery. The copper nail and the zinc nail worked as the positive terminal and the negative terminal of a battery, while the lemon juice acted as the chemical paste inside a battery. The zinc nail reacted with the acid in the lemon and released electricity. The copper nail facilitated the flow of this electricity from the zinc nail toward itself. As the electricity travelled, it powered the light bulb.

*The more lemons you connect, the brighter the light bulb will be.*



### How do batteries work?

A battery is composed of three major components – a positive terminal, a negative terminal, and a chemical paste. When the battery is connected to a circuit, a chemical reaction takes place and electricity flows from the negative terminal, powers the device, and returns to the positive terminal.