

Fruit Battery – Student Handout

Winters can be very cold in Canada, forcing Canadians to use more heat in their home. The extra heat is created from electricity which has to be bought from the local hydro company. This can be very expensive to do in the winter. To help people save money on electricity, you've been tasked with trying to create a clean and inexpensive form of electricity that can be used in your community.

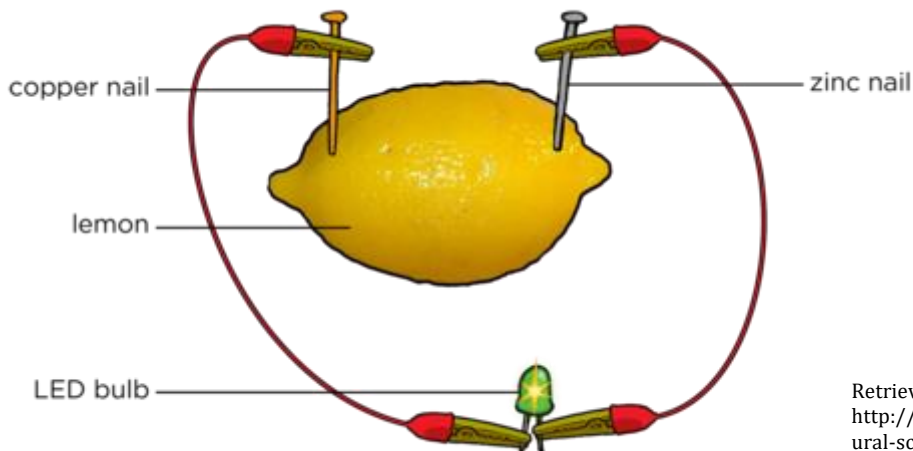
Your research has indicated that the citric acid found in fresh fruit acts as an electrolyte and can be used as an electrically conduction solution. Using this knowledge, your job will be to create a battery using three pieces of fruit and testing to see which one produces the greatest electric current when combined with negative and positive electrodes.

You will present your findings to the CEO of a local hydro company to persuade them to use your most effective fruit battery for mass production.

Previously Taught Concepts

- An electric current is a flow of electrons and is measured in amperes (or amps).
- Voltage is the force that pushes the electrons through a circuit (like water being pushed through a pipe) and it is measured in volts.
- When 2 metals of different reactivity are put in a conducting solution, a current is produced when electrons flow from one metal to the other.
- Alessandro Volta was the first person to make a battery (also called a “wet cell”).
- A wet cell is made up of a negative electrode, a positive electrode and an electrolyte (conducting solution).

Diagram of a wet cell:



Retrieved from:
<http://www.mstworkbooks.co.za/natural-sciences/gr9/gr9-ec-02.html>

The Experiment

1. Prepare your lemon by squeezing it on all sides with your hands. Make sure that you don't squeeze it so much that you break the skin of the fruit.
2. Insert a zinc nail all the way into one side of the lemon.
3. Insert the copper nail into the opposite side of the lemon.
4. Use an alligator clip to connect the long LED lead to the copper nail.
5. Use a second alligator clip to connect the short LED lead to the zinc nail.
6. Record what happened to the LED in your observations.
7. If you have a multi-meter, use it to find the current in your circuit and record your results for that trial.
8. Remove the zinc and copper nails and wipe off any excess juice.
9. Repeat steps 1-8 two more times by putting the nails in different places of the lemon. Record your observations and the current each time.
10. Calculate the average current produced by that fruit by adding the values from the three trials and dividing the sum by three.
11. Repeat the experiment with the three fruit that you chose.

Observations

Lemon

	Trial 1	Trial 2	Trial 3
Observations			
Current (milliamps)			

$$\text{Average Current} = \frac{\text{Current from Trial 1} + \text{Current from Trial 2} + \text{Current Trial 3}}{3}$$

Average Current =

Fruit #1:

	Trial 1	Trial 2	Trial 3
Observations			
Current (milliamps)			

$$\text{Average Current} = \frac{\text{Current from Trial 1} + \text{Current from Trial 2} + \text{Current Trial 3}}{3}$$

Average Current =

Fruit #2:

	Trial 1	Trial 2	Trial 3
Observations			
Current (milliamps)			

$$\text{Average Current} = \frac{\text{Current from Trial 1} + \text{Current from Trial 2} + \text{Current Trial 3}}{3}$$

Average Current =

Fruit #3:

	Trial 1	Trial 2	Trial 3
Observations			
Current (milliamps)			

$$\text{Average Current} = \frac{\text{Current from Trial 1} + \text{Current from Trial 2} + \text{Current Trial 3}}{3}$$

Average Current =

