

# Pumpkin Battery - Chemical Energy

## Materials

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- Pumpkin
- Alligator Clips
- Copper wire
- Zinc nail
- Ruler
- Multimeter or microammeter

## ? Question

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1. How will a pumpkin produce electricity with different metals?

## ✱ Hypothesis

Use the words **a lot**, **a little**, or **no** to complete the statements below:

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- a. I think the pumpkin will produce \_\_\_\_\_ electricity when the large nail and thick copper wire are pushed into the pumpkin 2cm.
- b. I think the pumpkin will produce \_\_\_\_\_ electricity when the large nail and thick copper wire are pushed into the pumpkin 4cm.
- c. I think the pumpkin will produce \_\_\_\_\_ electricity when the large nail and thick copper wire are touching inside the pumpkin.

## ✓ Procedure

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### Part One

1. Insert the large nail and thick copper wire into the pumpkin (do not let the ends of the metals touch).
2. Attach the end of one alligator clip to the positive (red) terminal of the microammeter, and the other end of the clip to the thick copper wire.
3. Attach one end of the second alligator clip to the negative (black) terminal of the microammeter, and the other end to the nail. Draw what you see.
4. Record the reading on the microammeter in your data table.

### What happens when you....

1. Push the nail and the wire further into the pumpkin?
2. Try a combination of metals and distances?
3. Which combinations of metals produced the most electricity?
4. Which produced the least?
5. Try different size pumpkins, squash, or pieces of fruit?

## Pumpkin Power

### Where do we see chemical energy in the pumpkin battery?

The juice in the pumpkin is an acid. Nails are often made of steel. This steel is coated in a metal like zinc to keep it from rusting. When the zinc on the nail and the copper wire were pushed into the pumpkin, chemical reactions took place. These reactions allowed the electrons to move freely through the juice.

### What is electrical energy?

Electrical energy is the movement of electrons. Lightning and electricity are examples.

### What is a circuit?

A circuit is a path that an electric current can follow.

### How do electrons flow in the pumpkin battery?

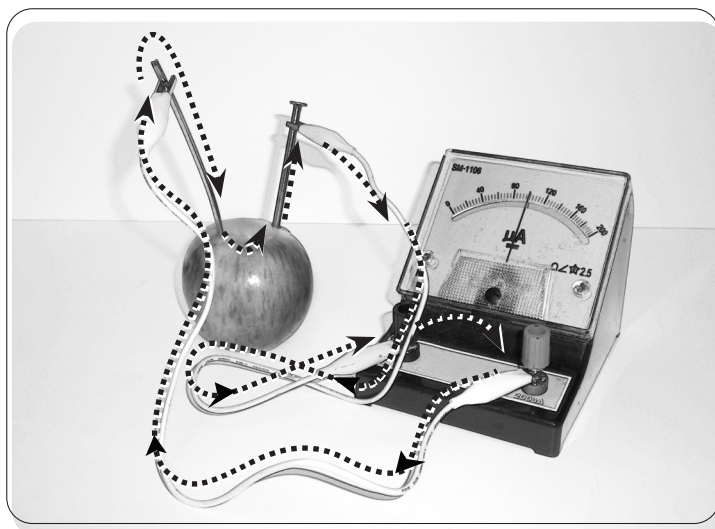
The reactions between the acid in the pumpkin and the two metals creates an electrical charge. The electrons flowed from the zinc coated nail through the microammeter to the copper wire and back through the pumpkin to the nail. The farther you pushed the nail and copper wire into the pumpkin, the greater the flow of electrons. This was visible through the higher reading on the meter. When the nail and the copper pieces touch, no current is produced and the meter reads as zero. This is because the pieces of metal that are touching are not able to react with the juice or acid in your pumpkin, and current is no longer able to flow.

### What transformation of energy is visible?

The chemical energy in the pumpkin is converted to electrical energy.

### What happened when you changed which metals were used?

When you attached the two copper wires to the microammeter, there should not have been any current. If you attached both nails to the microammeter, current was not produced in this case either. The combination of metals will determine whether the electron flow will occur and in which direction. A battery needs two different metals and an acid to work.



Zinc on the nail and copper react with the acid in the fruit (above, an apple) to produce an electric current. The arrows show the path of the electrons.