

# Can a Battery be Used to Store Energy?

**Overview:** We start our unit on energy with some of the most common sources of energy in our lives: batteries! We'll learn the basics of what makes them special.

**What to Learn:** Ask yourself how the energy is moved in this battery. What causes the electricity to flow?

## Materials

- Earphone or headset for a portable radio
- Small piece of aluminum foil
- Tomato juice
- New, shiny penny
- Two wires with alligator clips on each end of the wires
- Plate
- AA-size battery
- Spoon

## Lab Time

1. Examine the metal shaft of the part of the earphone or headset that is inserted into a portable radio. You will notice that just below the tip of the shaft there is a plastic spacer. Clip on one of the wires below this spacer. Then clip on the other wire above this spacer.
2. To test that the wires are properly connected to the earphone or headset, take the unconnected ends of the two wires and touch them to an AA-size battery. One wire should touch the positive end of the battery, while the other is touching the negative end of the battery. Place the earphone or headset to your ear. If your connections are made correctly, you should hear a crackling sound in the earphone or headset. If you do not hear a crackling sound, check your connections carefully.
3. Place a small piece of aluminum foil, about five inches (13 centimeters) square, on a small plate. Using a spoon, make a puddle of tomato juice on the aluminum foil. The puddle of tomato juice should be slightly larger than a penny. Next, place a new, shiny penny face down in the puddle of tomato juice.
4. Using the alligator clip, attach one of the wires connected to the earphone to one of the edges of the aluminum foil. Take the end of the other wire and touch the alligator clip to the penny. Move the alligator clip over the penny.
5. Record your observations on the worksheet below.

# Battery Observations

1. Do you hear a crackling sound when you touch the alligator clips to the penny in the puddle of tomato juice? What do you hear when you move the alligator clip over the penny?
2. What do you hear when you stop touching the penny with the alligator clip?

## Reading

In this experiment you made a simple battery with a penny, aluminum foil, and tomato juice. You completed a circuit with your battery by touching one of the wires attached to the earphone or headset to the penny, while touching the other wire to the aluminum foil. When you completed the circuit, a flow of electrons was produced by your battery. The crackling sound you heard was caused by the earphone or headset converting electrical energy from your battery into sound energy.

In your battery, the aluminum in the aluminum foil loses electrons. The other part of the reaction is more complex. Either the acid in the tomato juice or copper ions (that form when the copper metal in the penny reacts with the acid in the tomato juice) gain the electrons lost by the aluminum.

The main types of batteries are known as primary and secondary batteries. Dry cell batteries, like the ones used in flashlights and portable radios, are primary batteries. Another important primary battery is the mercury battery. Mercury batteries are typically small and flat. They are used to power cameras, watches, hearing aids, and calculators.

An advantage of primary batteries is that they are generally inexpensive. One disadvantage is that they cannot be recharged. When the chemical substances in the primary batteries are used up, the battery is dead.

Lead storage batteries and nickel-cadmium (NiCad) batteries are examples of secondary batteries. Car batteries are lead storage batteries. Flashlight batteries that are rechargeable are NiCad batteries. Secondary batteries are more expensive than primary batteries. However, unlike primary batteries, lead storage batteries and NiCad batteries can be recharged repeatedly.

**Exercises** Answer the questions below:

1. Fill in the blank: A battery produces \_\_\_\_\_ energy from \_\_\_\_\_ energy.
2. Another name for a battery is:
  - a. Solar array
  - b. Voltaic cell
  - c. Nuclear reactor
  - d. Fusion cell
3. As one chemical loses electrons, what happens to the other chemical?
  - a. It loses electrons
  - b. It gains electrons
  - c. Nothing
  - d. It decomposes
4. When will a battery run out?
  - a. When its batteries run out
  - b. When its chemicals are used up
  - c. When all the electrons are gone
  - d. When the bunny stops drumming

### Answers to Exercises: Can a Battery Be Used to Store Energy?

1. Fill in the blank: A battery produces \_\_\_\_\_ energy from \_\_\_\_\_ energy. (electrical, chemical).
2. Another name for a battery is: (voltaic cell)
3. As one chemical loses electrons, what happens to the other chemical? (gains electrons)
4. When will a battery run out? (when one of the chemicals is used up)