Build a Battery

Students make a battery using household items.

TECHNOLOGY TOPICS	PROCESS SKILLS	GRADE LEVELS
Resources History	Collecting Information Measuring Testing	3-8

TIME REQUIRED

Advance Preparation	Set Up	Activity	Clean Up
			
10 minutes	**2 minutes**	**10 minutes**	**2 minutes**

SUPPLIES

- wire (20 cm per student)
- tape (10 cm per student)
- pennies (10 per student)
- aluminum foil (10 cm square per student)
- headphones (1 per group)
- salt water (1/4 cup per group)
- paper towels (3 per student)
- batteries (3 per class)

ADVANCE PREPARATION

Note: Older students could do these steps as part of the activity.

- Cut the wires into strips about 30 cm (one foot) long, and strip the insulation off of 3 cm at each end.

- Cut the aluminum foil into squares a little smaller than a penny, about 1 cm x 1 cm.
- Cut paper towels into squares about 5 cm x 5 cm (about 2 “ by 2”).

SET UP

Set out for each student:

- 10 pennies
- 10 pieces of paper
- 10 pieces of aluminum foil
- 2 pieces of wire
- one headset or earphone

INTRODUCING THE ACTIVITY

Let students speculate before offering answers to any questions. The answers at the right are provided primarily for the teacher’s benefit.

Ask the students the following questions in **bold**. Possible student answers are shown in *italics*.

Show the students some batteries.

What do batteries do?
They make electricity. They make things work.

Explain that they are going to make some batteries.

CLASSROOM ACTIVITY

Each student follows the directions below.

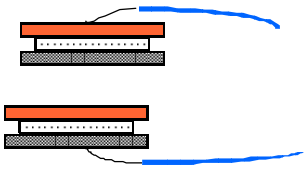
Procedure for Build a Battery

1 **Make salty towels.**

- Fold the squares of paper towels so that they are slightly smaller than the size of a penny.
- Submerge the towels in the salty water and squeeze out the excess liquid by pressing on the towel.
- The towels should be moist but not dripping wet.

2 **Make a cell.**

- Sandwich the piece of moist paper towel between a penny and a piece of aluminum foil.
- Tape one end of a wire to the top surface of the penny (This will be the top of the battery).



3 **Make another cell.**

- Make another sandwich.
- Tape one end of the other wire to the surface of the aluminum foil (This will be the bottom of the battery).
- Set these two sandwiches aside.

4 **Make 8 more cells.**

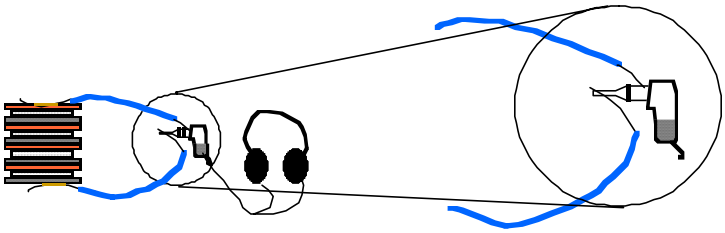
- Make 8 more penny-foil sandwiches.
- Stack them on top of each other with the aluminum side down.

5 **Stack the cells into a battery.**

- Place the sandwich with the wire taped to the aluminum foil on the bottom of the stack.
- Place the sandwich with the wire taped to the penny on the top of your stack.

6 Hear the battery make electricity.

- Touch the free ends of the wire to the headset plug as shown in the picture.



- You should hear a crackling sound in the headset each time you touch a wire end to the plug.
- This shows that an electric current is flowing through the wires and speaker. Touch wires to a store-bought battery to demonstrate this.

EXPLANATION

In-depth background information for teachers and interested students.

The battery you created is converting chemical energy to electrical energy. The paper towel soaked in salt water causes a chemical reaction with the aluminum foil. While the aluminum has a tendency to lose its electrons, the copper tends to gain electrons. The freed electrons flow through the wire, through the headset, and then back through the wire attached to the penny. This creates a charge imbalance that causes even more electrons to move. This imbalance keeps your battery going until the aluminum is used up (or more likely, the paper towel dries up!)

This kind of battery–a pile of metallic disks separated by salty cloth–is a voltaic pile, the very first kind of battery! In the late 1700's, an Italian named Alesandro Volta had an idea that metals separated by a material soaked in acid would create electricity. He believed in his idea, but had to prove to other people that electricity was indeed produced. So he decided to put enough "metallic sandwiches" piled on top each other to produce a convincing shock. The unit of electrical energy, the volt, is named after him.

For more information:
Flying Tinsel, An Unusual Approach to Teaching Electricity, Grant Mellor, Cuisenarie Company of America, Inc., 1993, ISBN 0-938587-33-1

175 More Science Experiments to Amuse and Amaze Your Friends, Terry Cash, Steve Parker, and Barbara Taylor, Random House New York, 1990, ISBN 0-679-80390-4

OPTIONAL EXTENSIONS

Change some variables

What makes a difference in how well the battery works? Have the students try changing the variables:

- What happens if you change the number of sandwiches?
- Does it work with different combination of metals (like nickels or dimes)?

- What happens if the paper is dry?
- What happens if you soak the paper towel in a different kind of liquid? Does it matter if the solution is an acid or a base?
- What happens if the wires touch the side of the piles instead of the top?

CROSS-CURRICULAR CONNECTIONS

SAFETY

Have students write to their local power company for information about electricity safety.

Have students make safety posters to hang in the school, local library, a local store, or other community centers.