



## SCIENCE PROJECTS

# H<sub>2</sub>O Electrolysis

## Splitting Water!

Electricity is "created" when certain chemicals react together. We use chemically- made electricity to power many machines from flashlights to a watch or sometimes a car. Yes, there are cars that run on electricity! The devices that store electricity are called batteries. Electricity can also be used to produce chemical changes.

Water is a simple chemical made from two gases -- hydrogen and oxygen. Every molecule of water has two atoms of hydrogen for every atom of oxygen. **H<sub>2</sub>O** is the chemical formula for a molecule of water.

If an electrical current is passed through water between electrodes (the positive and minus poles of a battery), the water is split into its two parts: oxygen and hydrogen. This process is called electrolysis and is used in industry in many ways, such as making metals like aluminum. If one of the electrodes is a metal, it will become covered or **plated** with any metal in the solution. This is how objects are **silverplated**.

You can use electricity to split hydrogen gas out of the water similar to the process called electrolysis.

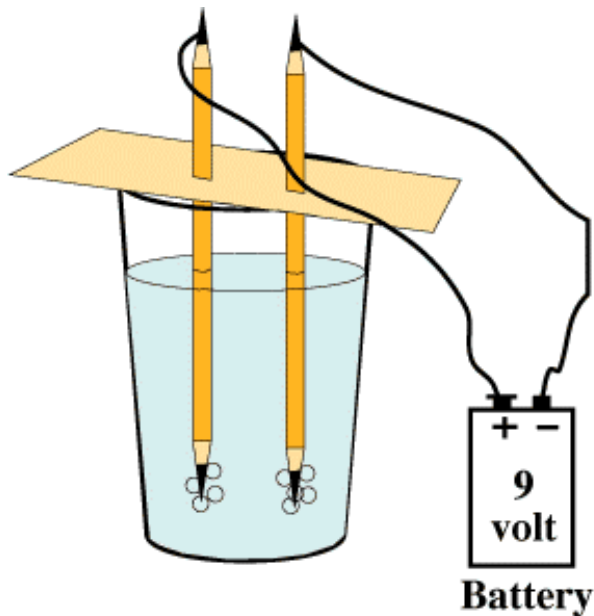
Try This!

### What do you need?

1. A 9 volt battery
2. Two regular number 2 pencils (remove eraser and metal part on the ends)
3. Salt
4. Thin cardboard
5. Electrical wire
6. Small glass
7. Water

### What to do?

- 1 Sharpen each pencil at both ends.
- 2 Cut the cardboard to fit over glass.
- 3 Push the two pencils into the cardboard, about an inch apart.



- 4 Dissolve about a teaspoon of salt into the warm water and let sit for a while. The salt helps conduct the electricity better in the water.
- 5 Using one piece of the electrical wire, connect one end on the positive side of the battery and the other to the black graphite (the "lead" of the pencil) at the top of the sharpened pencil. Do the same for the negative side connecting it to the second pencil top.
- 6 Place the other two ends of the pencil into the salted water.

## What you'll discover!

As the electricity from the battery passes through and between the electrodes (the pencils), the water splits into hydrogen and **chlorine** gas, which collect as **very** tiny bubbles around each pencil tip.

Hydrogen collects around the cathode and the chlorine gas collects around the anode.

How can you get chlorine from H<sub>2</sub>O? Good question! Sometimes in experiments, a secondary reaction takes place. This is what happens in this experiment.

Oxygen is not given off in this experiment. That's because the oxygen atoms from the water combine in the liquid with the salt to form hydroxyl ions. Salt's chemical formula is NaCl - sodium chloride. The chlorine gas is from the chloride in the salt. The oxygen in the hydroxyl ions stay in the solution. So, what is released in this reaction is not oxygen but is chlorine gas that collects around the pencil tip. Around the other pencil is hydrogen gas.

In real electrolysis systems, a different solution is used, and higher levels of electricity help to split the water molecules into hydrogen and oxygen without this secondary reaction.

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