

EL-ELECTRO ELECTROLYSIS ELECTRODES

These insulated stainless steel electrodes are designed to demonstrate the decomposition of water into hydrogen and oxygen gas. **Use these electrodes according to either the following instructions or those in your curriculum or lab guide.**

Additional Materials Required:

- 1 250 ml beaker (HTT item CE-BEAK250) or a common household cup
- 2 large test tubes (CE-TTUBELG)
- 1 6 volt battery (EL-BATT6)
- 1 glass stir rod (CE-STIRROD)
- 1 bottle (30 g) sodium sulfate (CH-NA₂SO₄)
- 1 package wooden splints (CE-SPLINT)
- 1 pair alligator clip leads (EL-ALCLIP2) or copper wire (EL-WIRE24C)
- 1 100 ml graduated cylinder (CE-CYPS100, CE-CYPP100 or CE-CYGL100) or a measuring cup

Learning Objectives:

1. Decompose water into hydrogen and oxygen gas.
2. Test and measure the volume of hydrogen and oxygen produced.
3. Explain the chemical transformation that occurs and why.

Procedure:

1. Prepare a 1 M sodium sulfate solution by dissolving 13 g of solid sodium sulfate (approximately half the bottle) in 100 ml (about a third of a cup) of water. (Read the information on label of the chemical bottle and wear appropriate safety equipment.) Stir until completely mixed.
2. Fill the beaker or cup approximately 1/2 full of water. Then fill the each test tube with water and invert it in the beaker while placing your thumb over the top. You want both test tubes to be upside down in the beaker, completely full of water. A few practice runs at this might be necessary.
3. Add the 100 ml of sodium sulfate solution to the beaker and stir, being careful not to upset the test tubes. The more the sodium sulfate is mixed through the water, the faster the reaction will occur.
4. Carefully slide the U-shaped end on one electrode into the opening in one test tube while keeping the test tube full of water. Repeat with the other electrode and test tube. Make sure the electrodes do not touch.
5. Connect the top part of each electrode to different terminals on a 6 volt battery or transformer using the alligator clip leads or other wire.
6. Hydrogen and oxygen gas bubbles will be produced from each electrode. If no reaction is occurring, move the electrodes up and down a few times to mix the sodium sulfate into the water in the test tube. Additional sodium sulfate can be added to speed up the rate that the bubbles are produced. Why?
7. Collect the gases until one test tube is almost full. Mark the water level in each test tube with a black crayon or wax pencil.
8. Carefully remove the test tubes while keeping them upside down to avoid losing the gas. Test the gas in each test tube with a burning splint. Which is hydrogen? Which is oxygen?
9. Measure the volume of gases produced by filling each test tube with water to the wax pencil mark and then measuring the volume of water with a graduated cylinder. What is the ratio of hydrogen produced to oxygen? Why?
10. Rinse the electrodes well in clean water when you are done.