HYDROGEN

Hydrogen rarely exists by itself in nature, so it is typically obtained through the process of reforming *(heating)* or electrolysis *(splitting water)*. This experiment will show you how hydrogen can be produced through electrolysis - the splitting of water into its two main elements (hydrogen and oxygen).

Instructions:

1. Insert two metal push pins into the plastic cup *(sharp points facing into the cup)* *insert the same distance apart as the hubs on the 9V battery
2. Fill the cup about half full with water
3. Mix a pinch of baking soda into the water
4. Place the cup on top of the 9V battery *(the metal push pins should be touching the battery hubs)*
5. Observe the tops of the push pins - what do you see happening?

What is happening?

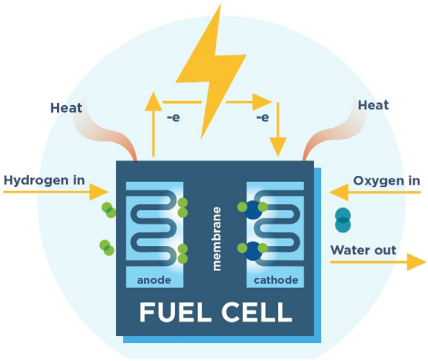
Electricity is flowing through the water, which breaks up the water *(H_2O)* into its components - hydrogen gas and oxygen gas. You can tell the gases are forming from the bubbles flowing upward from the battery hubs. There will be twice as much hydrogen gas as oxygen gas (*remember it is H_2O!)*, so the battery hub with more bubbles is the hydrogen.

Extension:

1. Baking soda works as an electrolyte when mixed with water, so it allows an electric current to flow through. Try the experiment with different solutions:
    - Does it work with lemon juice? Salt water? Distilled water? Tap water?
    - Remember, an electrolyte solution is needed to carry a current and form gas. Salt water and lemon juice water should work well. Distilled water should not produce any current at all, whereas tap water will likely produce a small amount of gas because it contains some minerals and impurities. Try out these solutions and find out for yourself!

How do we get energy from hydrogen?

Hydrogen fuel cells use hydrogen and oxygen to produce electricity, heat and water through an electrochemical reaction. The fuel cells produce energy efficiently without releasing greenhouse gases. To operate, a hydrogen fuel cell needs a constant supply of hydrogen. Hydrogen can be obtained by separating water into its two main elements *(hydrogen and oxygen)* through a process called electrolysis. Hydrocarbons like natural gas and gasoline also contain hydrogen, which can be separated out through a process called reforming *(which means adding heat).*



Blue hydrogen:
Refers to hydrogen that is made from a non-renewable resource such as natural gas, with Carbon Capture, Utilization, and Storage (CCUS) as part of the process.

Green hydrogen:
Refers to hydrogen that is made from a renewable resource such as water, solar or wind.

What is going on with hydrogen in Alberta?

On November 5th 2021, the Alberta government released Alberta's Hydrogen Roadmap, which lays out the path to building a provincial hydrogen economy and accessing global markets by 2030. The plan aims to see hydrogen used for transportation, electricity, heat, renewable energy storage and industrial use *(more details:* ***https://www.alberta.ca/hydrogen-roadmap****)*

Over $106 million in funding has been provided by Alberta Innovates and Emissions Reduction Alberta for 37 new hydrogen projects in the province. Check out some of the projects here: ***https://www.alberta.ca/economic-opportunities***