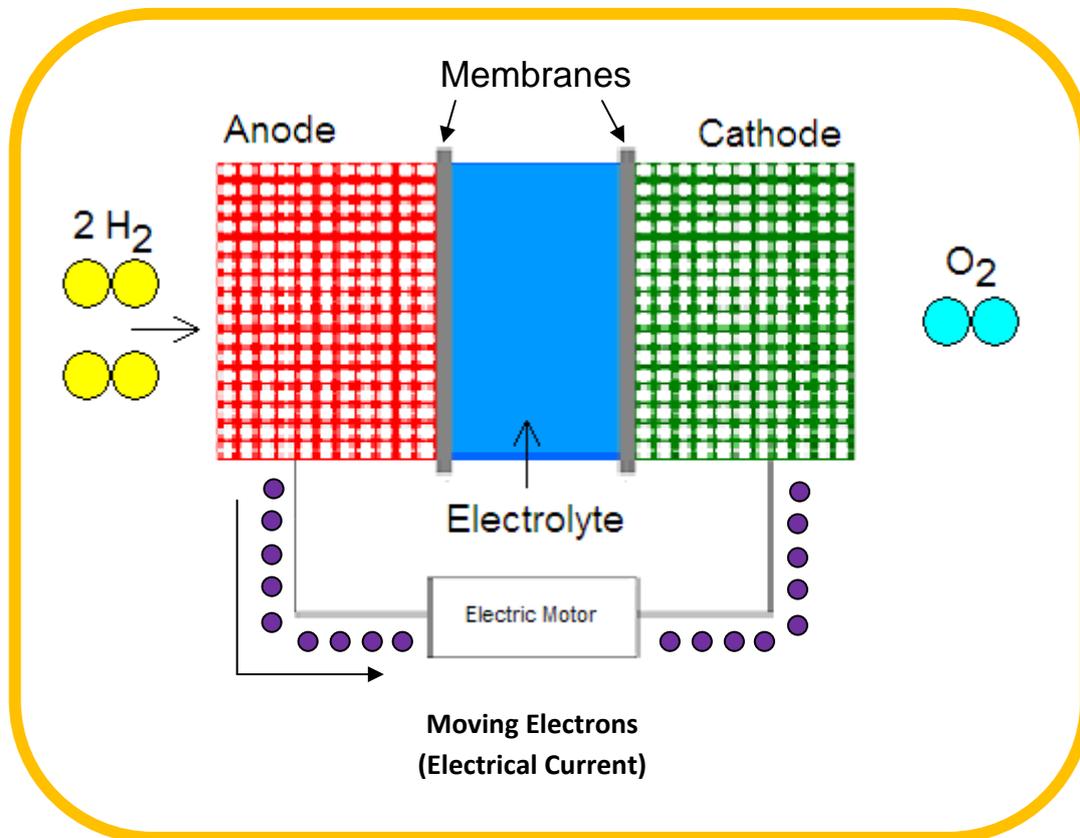


PRACTICAL INVESTIGATION:

Hydrogen Fuel Cell

How Does a Hydrogen Fuel Cell Work?



Simple Explanation

In a nutshell a hydrogen fuel cell converts the chemicals hydrogen and oxygen into water and in the process of doing so produces electricity.

More Complex Explanation:

The hydrogen fuel cell operates similar to a battery. It has two electrodes, an anode (Negative electrode) and a cathode (positive electrode), separated by a membrane (refer to above diagram). Oxygen passes over one electrode and hydrogen over the other.

The hydrogen reacts to a catalyst (A chemical substance that increases the rate of a chemical reaction) on the electrode anode that converts the hydrogen gas into negatively charged electrons (e^-) and positively charged hydrogen ions (H^+).

The electrons flow out of the cell to be used as electrical energy. The hydrogen ions move through the electrolyte membrane to the cathode electrode where they combine with oxygen and the electrons to produce water. If pure hydrogen is used as a fuel, fuel cells emit only heat and water, eliminating concerns about air pollutants or greenhouse gases. Unlike batteries, fuel cells never run out. They will produce power as long as there is hydrogen fuel.

The hydrogen required to power a fuel cell has to come from somewhere, and water (H_2O) is one possible source. The hydrogen and oxygen in water can be separated from one another through a process called water electrolysis, which you can do with the following simple classroom experiment.

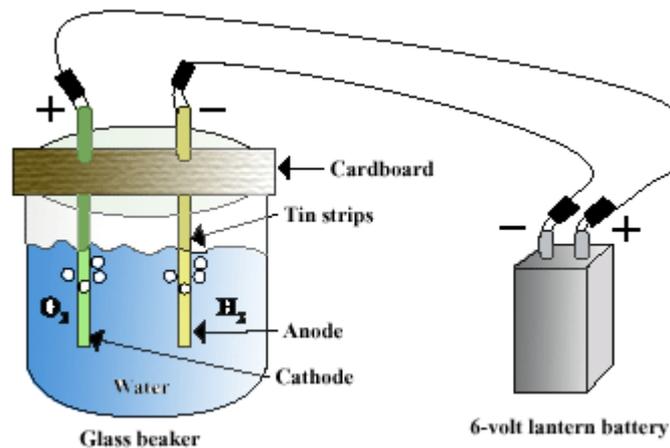
PRACTICAL INVESTIGATION

Making Hydrogen Fuel

The hydrogen required to power a fuel cell has to come from somewhere, and water (H_2O) is one possible source. The hydrogen and oxygen in water can be separated from one another through a process called water electrolysis, which you can do in this simple science experiment.

Equipment

- A 400ml clear beaker
- Tap water
- Two 20cm or longer test leads (wires) with double-ended alligator clips
- A 6-volt battery
- A strip of cardboard, about 10cm wide and 5cm longer than the top of your beaker
- Two electric-conducting tin strips



Method

1. Fill the beaker 3/4 full with tap water.
2. Cut two small slits in the cardboard, which will serve as a holder and insulator for the tin strips.
3. Slide the tin strips into the cardboard so the tips of the strips dip into the water.
4. Attach the double-ended alligator clipped wires to the battery.
5. Connect the opposite end of the wires to the tin strips.
6. Observe what happens.

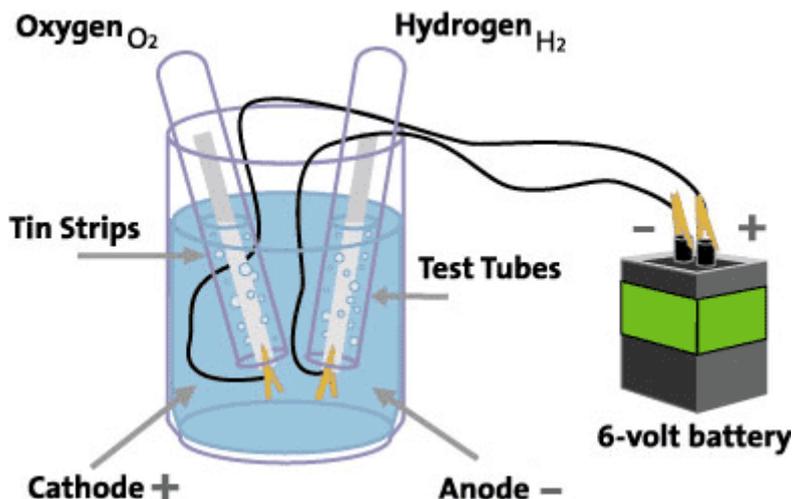
What Happened?

Explaining what you observed.

This water electrolysis experiment uses common science materials to demonstrate how water can be broken down into the separate elements of oxygen and hydrogen. Fuel cells convert the chemical energy of a fuel into electricity and heat, without burning the fuel.

After connecting the battery to the tin strips, tiny bubbles should form on each tin strip electrode. The bubbles are the visible evidence that water is breaking down into its separate components of hydrogen and oxygen.

- Hydrogen gas bubbles form around the **anode** (negative electrode).
- Oxygen gas bubbles form around the **cathode** (positive electrode).



You can collect the hydrogen and oxygen gasses by inverting a test tube and placing it over the tin strips in the water.

Developing alternative fuel sources such as those based on hydrogen are critical to solving future energy needs. Hydrogen is the most abundant and non-polluting element on Earth. Possible sources include water, propane, natural gas, and wind, solar, geothermal, and even gasoline.

Source:

General Motors Company

http://www.gm.com/experience/education/5-8/fuels_energy/hydrogen/weekly_reader_activity2.jsp