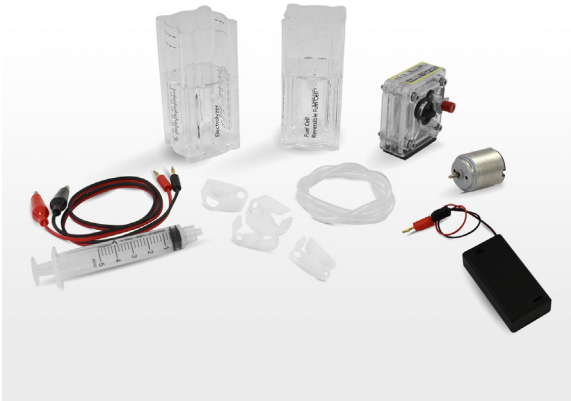




FUELCELL Store

Fuel Cell Science Fair Kit

Product Code: 7110302



FuelCellStore.com
+1 (855) 251 0016
sales@fuelcellstore.com



Safety

Read all instructions before use.

The Science Fair Fuel Cell Kit has been developed to provide the safe study of hydrogen fuel cell technology. Special care must be taken to maintain a safe study environment. Once safety is ensured, we can delve into creating energy with a reversible fuel cell, an all-in-one device that is an electrolyzer as well as a fuel cell.

1. Always work with adult supervision.

2. Protect your eyes! Use safety goggles. Anytime you are performing experiments of any kind, eye protection is important.

3. Never work around sparks or flames. Hydrogen and oxygen are extremely flammable. Even though they are contained safely in this kit, it is important to take caution.

4. Follow instructions. The instructions in this manual are structured to provide the safest environment for you and to preserve the equipment.

5. Turn off the battery pack when not in use. When the battery is turned on, **do not allow the metal leads to touch**, this could cause the battery to overheat, resulting in plastic melting and fire danger or skin burns. **Remove the batteries during storage.**

6. Empty all water, hydrogen and oxygen from each component before storage.

Assembly and Operating Instructions

Preparation

Items you will need that are not included in this kit:

- 2 AA batteries
- 100mL distilled water (you can purchase this at your local grocery store) *****Purified water is NOT the same — it must be DISTILLED**

Items Included:

1 Reversible Fuel Cell (an Electrolyzer and Fuel Cell all-in-one device).



1 Motor



2 Storage Tanks



2 Alligator Clamp to Banana Plug Cables (1 red, 1 black)



4 Tubing Clamps



1 Piece of Tubing



1 Syringe



1 Battery Pack



Potential Topics for Science Projects

Does temperature effect the output of a fuel cell?

Does temperature effect the production of hydrogen and oxygen?

What is the ratio of hydrogen to oxygen produced?

What is the efficiency of a hydrogen fuel cell?

How much hydrogen would you need to run a household appliance?

How does a fuel cell operate?

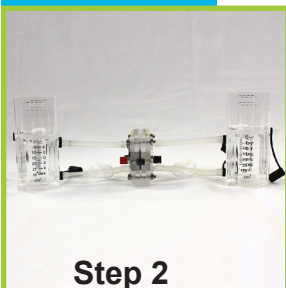
Hydrogen/Oxygen Operation



Step 1

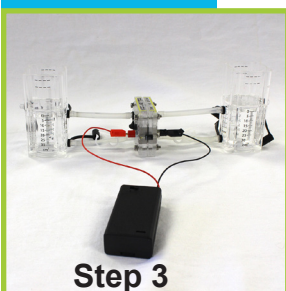
Take the piece of tubing, and from it, cut four short sections (roughly 4 cm long, each). Save the left over, longer pieces of the tubing for later.

Attach one short section of tubing to each inlet on the fuel cell on one side. The tubing on the bottom inlet of both sides should have a clamp. The other side should be connected to the "Electrolyzer" side of the storage tanks.



Step 2

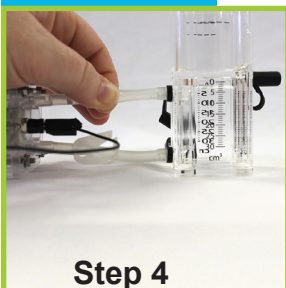
With the tube clamps open and the caps on the "Fuel Cell" side of the storage tanks open, fill both storage tanks with DISTILLED water. Fill the tanks to the 0 mark in the bottom half of the storage tanks.



Step 3

Connect the battery pack to the Reversible Fuel Cell and switch it to the "ON" position. Take care to ensure correct polarity (Red = "+", Black = "-").

This will engage the Electrolyzer mode of the RFC. Hydrogen and Oxygen will begin to be created.



Step 4

To purge any water from the system run the RFC for a minute or two. Then, pinch the top tube until gas bubbles out from the bottom tube. When gas begins to bubble out of the bottom ports, close the clamp on the bottom tube, and the cap on the Fuel Cell side of the Storage Tank. You can now let go of the top tube, and repeat on the other side of the RFC.

Step 5

Gas will begin to displace water from the bottom half of the tank, to the top half. Hydrogen will be created on the Negative side, and Oxygen on the Positive side. Hydrogen will be created at a 2:1 ratio.

Run the RFC until all the water from the Hydrogen side has been displaced to the top half of the tank, and gas begins to bubble out.



Step 6

Disconnect the battery pack from the RFC.

Step 7

Connect the 2mm banana cable to the RFC, ensuring correct polarity (Red = "+", Black = "-").

Connect the alligator clips from the same cable to the motor, ensuring correct polarity (Red = "+", Black = "-").

******NOTE: The positive lead on the motor will be indicated by a small + symbol above the connection. Connecting the leads in reverse on the motor will simply turn the motor's shaft in the opposite direction.**

Step 8

The RFC is now operating in Fuel Cell Mode. It should continue to operate until all the gas is consumed.

If the RFC stops operating before all the gas is consumed, please see the Troubleshooting section on the next page.



Hydrogen/Air Operation

Follow Steps 1-4 from the previous page.



After purging water, disconnect the storage tank from the positive side of the RFC. Then, remove the stopper from the Air side of the RFC.

Then, continue to follow the steps on the previous page.

Troubleshooting

The RFC stops working before all gas is consumed.

After 3-4 runs from Electrolyzer to Fuel Cell Mode, water droplets will build up on the electrodes. This will limit the performance in Fuel Cell mode.

To limit water inside the cell, run in Electrolyzer mode until all the water has been displaced to the top half of the storage tank.

Since gases are consumed at a 2:1 ratio, you will only use half the oxygen with this method.

The voltage spikes or dives in Electrolyzer Mode.

Open the bottom clamp on the Oxygen (Positive) side of the RFC, and repeat the process described in **Step 4** of the Operation instructions.

The Fuel Cell has very little power.

The fuel cell was stored too dry or for too long. A fuel cell with a dry polymer electrolyte membrane (PEM) loses power.

Continue operation. The fuel cell moistens itself during operation which slowly allows it to reach its full capacity again.

To keep this from happening, store the RFC in a zip-top bag, with tubing connecting the top and bottom ports on each side.

Results and Conclusions

What were the results of your experiment and how did they compare to your hypothesis?

What conclusions can you draw from the data you collected?

What other problems could you potentially solve with the use of your research?

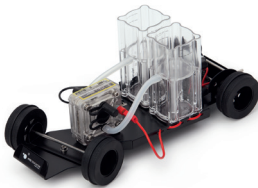


facebook.com/FuelCellStore



[@FuelCellStore](https://twitter.com/FuelCellStore)

Check out some of our other products!



Tutorial HyRunner
Product Code: 1071004



Junior Basic
Product Code: 1071006

FuelCellStore.com
+1 (855) 251 0016
sales@fuelcellstore.com