P g1	Water = 2 Parts of Hydrogen + 1 Part of Oxygen	heliocentris

Materials required:

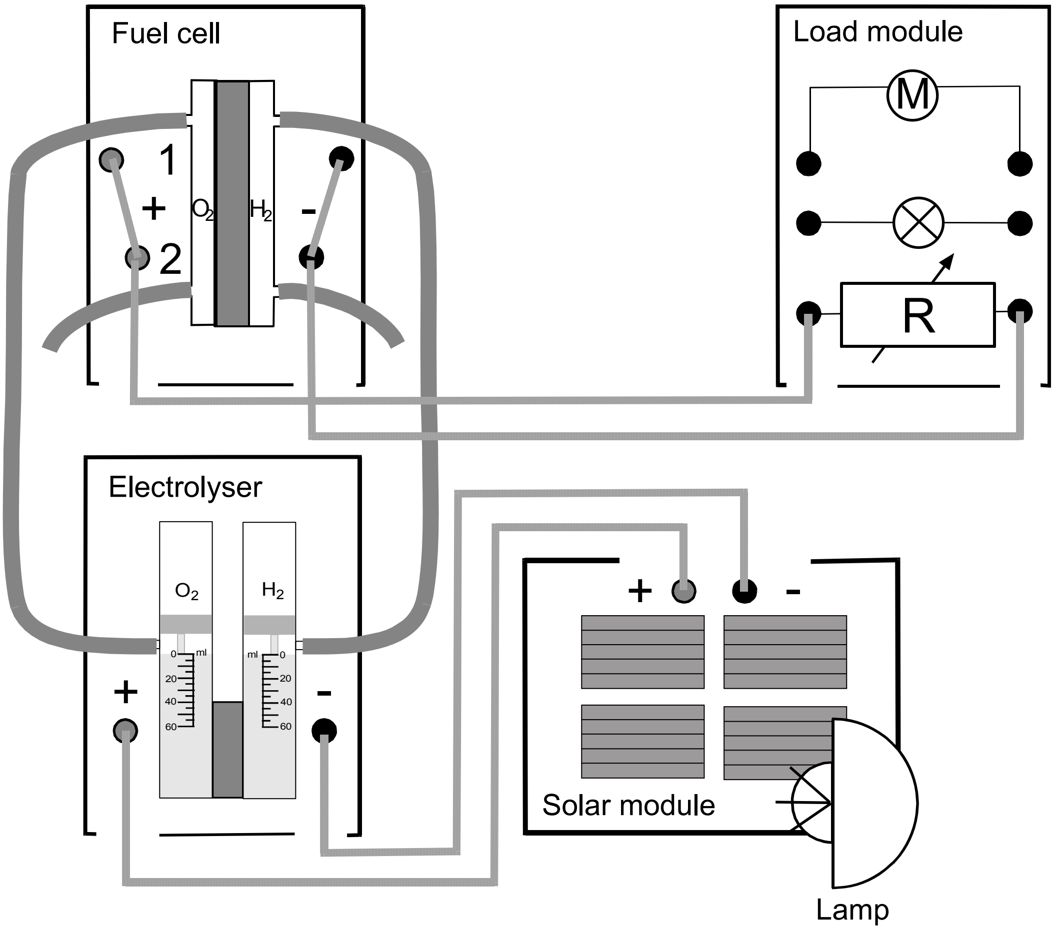
Solar module
Electrolyser
Fuel cell
Load module
Lamp 100-150 watts

6 hook-up cables
2 long tubes
2 short tubes
2 tube clips
<u>Additional components:</u>
Distilled water

Instructions:

Please follow the operating instructions!
Wear protective goggles and keep ignition sources at a distance when experimenting!!!

Fig. g1a (Purging):



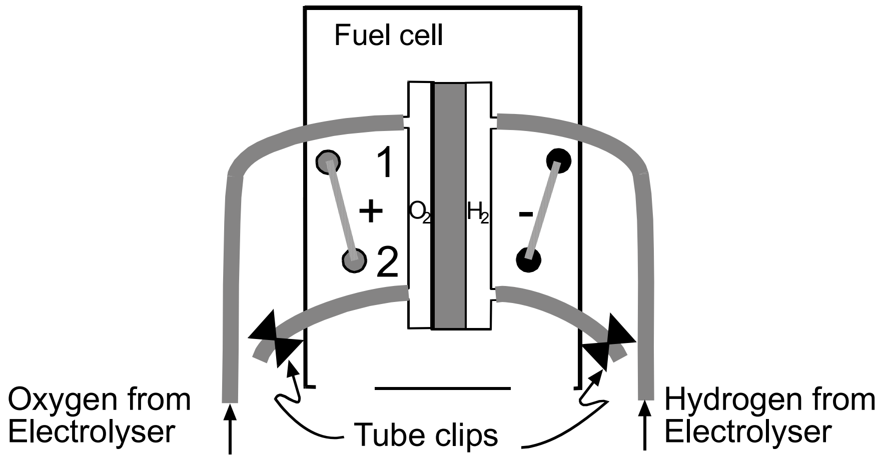
1. Set up the apparatus as shown in Fig. g1a. As an alternative to the solar module, you can also use a DC power supply if you want the electrolyser to fill up more quickly.
NB: the voltage across the DC power supply must not exceed 1.8 volts, the current must not exceed 3 amps. Check the polarity of the electrolyser!

2. Check that the gas tubes between the electrolyser and the fuel cell are correctly connected. Adjust the rotary switch on the load module to "OPEN".

3. Make sure that both of the electrolyser's gas storage cylinders are filled with distilled water up to the 0 ml mark. Use the illuminated solar module to set a constant current (between 700 and 900 mA). The solar module must be aligned toward the light source in such a way that gas production can be clearly observed (see Experiment e1).

4. Purge the entire system for 5 minutes with the gases produced. Then set the rotary switch on the load module to 2 Ω. The ammeter should now show a current of about 400 mA and the voltmeter a voltage of about 0.75 volts. Now turn the rotary switch on the load module back to "OPEN".

Fig. g1b (Measurement):



5. Use the clips to close the two short tubes at the gas outlets of the fuel cell (see Fig. g1b).

6. Interrupt the connection between the solar module and the electrolyser when the 60 ml mark is reached on the hydrogen side of the electrolyser. Also measure the volume of oxygen generated during the same period.

7. Adjust the rotary switch on the load module to a resistance of 0.5 Ω. A current flows, and the fuel cell consumes the stored hydrogen.

8. Interrupt the electrical connection when the 0 ml mark on the hydrogen side is reached by setting the rotary switch to "OPEN". The fuel cell has now consumed all the stored hydrogen (60 ml). Measure the volume of consumed oxygen.

9. Remove the clips from the fuel cell.

Table of measurements:

	Decomposition of water in the electrolyser:	Consumption by the fuel cell:
Volume of hydrogen	ml	ml
Volume of oxygen	ml	ml

Evaluation:

1. Measure the respective gas volumes.
2. Determine the ratio of the gas volumes released during electrolysis.
3. Determine the ratio of the gases consumed by the fuel cell during operation.

Interpretation/Notes:

The experiments carried out demonstrate the decomposition of water into 2 parts of hydrogen and 1 part of oxygen:

$$2H_2O \rightarrow 2H_2 + O_2$$

In the fuel cell, the reverse of electrolysis takes place, i.e. the gases stored during electrolysis are converted back into water.

$$2H_2 + O_2 \rightarrow H_2O$$

This proves that this reaction is reversible. The first reaction (electrolysis) expends electrical energy, whereas the second reaction (fuel cell) releases electrical energy. Altogether such a cycle involves energy losses, i.e. the efficiency level is less than 1.