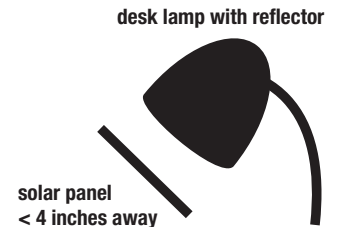


READ BEFORE YOU BEGIN!

IMPORTANT NOTE ABOUT THE SOLAR PANEL



If you are using an artificial light source to power the solar panel, you must use a 75-watt (or higher) incandescent light bulb. We recommend using a 100-watt, uncoated, incandescent light bulb in a desk lamp fixture with reflector cone or shade. We recommend placing the solar panel no less than 4 inches away from the bulb. You can also use sunlight outside on a sunny day, which is far more powerful than any regular light bulb. If you use an insufficient light source, the solar panel will not be able to generate enough electricity to power the electric motor or to perform electrolysis in the fuel cell.



TECHNICAL ALTERATIONS AND CORRECTIONS



1. Banana Plugs. Special banana plugs have been pre-attached to some wires to yield stronger connections. Thus, you will not need to attach banana plugs to the following wires, as stated in the instructions: 1) red and black wires attached to fuel cell chassis, 2) red and black wires attached to solar panel, 3) red and black wires attached to motor, 4) both ends of red and black connection wires.

2. Resistors. While the parts list says that there should be four resistors in Bag #17, there should in fact only be three resistors, as shown in the contents diagram on page 4 of the manual.

3. Syringe Tip. The syringe tip (Bag #16) in your kit may be either red or white in color. The manual often shows or refers to a red syringe tip. The color does not affect the functionality of the kit.

QUICK START INSTRUCTIONS

Your Fuel Cell Car & Experiment Kit comes packaged with a 96-page Experiment Manual which thoroughly explains the science behind the Fuel Cell car in 33 experiments. These Quick Start Instructions are provided as a shortcut for assembling and running the car.

1. Assemble the Car

Assemble the car as shown in Figure 1. If you have questions about part names, see page 4 of the lab manual for names and pictures of all the parts. Refer to page 14 in the manual for assembly instructions.

Note: When you are inserting the wheels and tires onto the axles be very careful that your finger is not over the outside hole of the wheel. The axle can slip on the wheel and could puncture your finger.

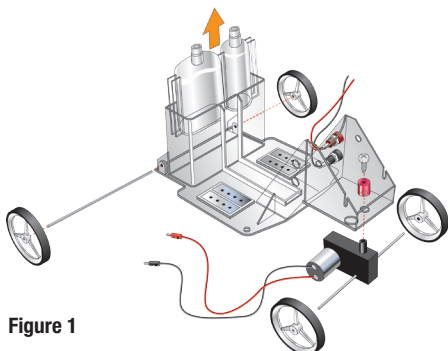


Figure 1

Attach the solar panel as shown in Figure 2.

Attach the tubes to the Fuel Cell as shown in Figure 3. Refer to page 57 in the manual for the instructions of cutting the tubing. You need to cut two 5 cm long pieces and two 17 cm long pieces. The remaining piece of tubing will be used with the syringe to purge the air from the fuel cell which will be covered in step 3.

The fuel cell has two distinct sides, the blue is the oxygen side and the red is the hydrogen side. Insert the fuel cell into its slot on the chassis so that the red side is on the right (your right, as if you were sitting in the car facing forward). The shorter 5 cm tubes are inserted on the top stubs of the fuel cell and are capped with the red plugs. The longer 17 cm tubes are inserted on the bottom stubs of the fuel cell and are capped with the clear transparent nozzles.

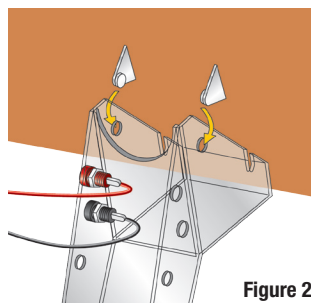


Figure 2

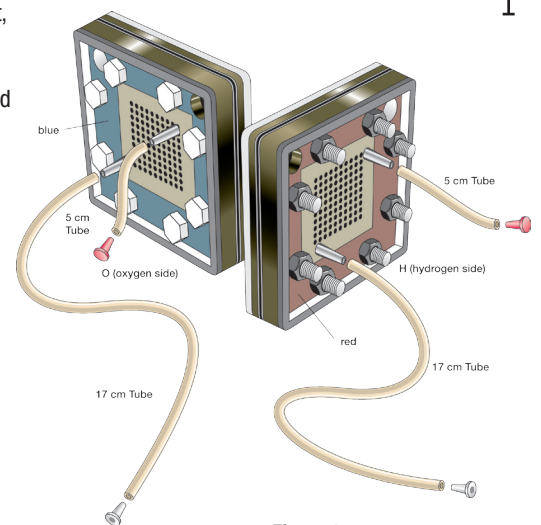


Figure 3

Use these guides to help you measure and cut the tubing.



Insert the longer tubes from the Fuel Cell into the gas collector tanks as shown in Figure 4. To do this, you will need to first insert the tube through the hole in the top of the gas tank, and then attach the small clear nozzle tip onto the tube. The nozzle tip will not fit through the hole in the tank. Firmly pull the hose with the nozzle tip attached so as to wedge the nozzle into the hole in the tank to create a tight fit.

Insert the gas tank into the tank holder on the back of the Fuel Cell, with the smaller Oxygen tank on the left and the larger Hydrogen tank on the right, as shown in Figure 5.

Do not worry yet about how the wires are connected. You will connect the wires in step 4. Press the Fuel Cell into its holder on the plastic car chassis.

Note: Do not pick up the car by the Fuel Cell as it may fall out.

2. Fill the Tank with Distilled Water

Add distilled water almost to the top (3/4 full is good) of the tank chamber at the back of the car, as shown in Figure 6. You must use distilled water; do not use regular tap water. The amount of water added is not critical as long as you have enough to keep the chamber from running dry when the gas in the tanks is removed in the next step. Adding too much water means the water will just spill out when you handle the car or “gas” it up.

3. Fill the Fuel Cell with Water

Next, suck the air out of each side of the Fuel Cell with the syringe. In doing so, you will suck water into the Fuel Cell from the tank. Take the syringe from your kit and slip the extra piece of tubing over the end of the syringe. Insert the small piece of hard tubing (the syringe tip) into the end of the flexible tubing. You are now ready to fill the fuel cell with water. Remove the red plug from the short piece of tube and connect the syringe tip to it. To do this, remove the red stopper plug from the clear hose coming off of the Cell, insert the syringe tip into the hose, pull the syringe handle and suck out the air (Figure 7). You can stop when you see a steady flow of water without air bubbles coming through the tube into the syringe. Then, while pinching the tube, remove the syringe tip from the tube and reinsert the red stopper plug into the tube without letting air back into the Cell. Put the excess water in the syringe back in the gas tank area. Repeat for the tube on the other side of the Cell.

4. Connect the Wires for Solar-powered Electrolysis

Next, connect the red and black wires on both sides of the Cell for the gas-generation phase of the process, as shown in Figure 8: the red wire from the solar panel should be plugged into the same metal strip as the red wire from the Fuel Cell, and the black wire from the solar panel should be plugged into the same metal strip as the black wire from the Fuel Cell. No other wires (such as the wire to the motor) should be plugged into this strip at this time. Thus, there is a direct

connection from the solar panel to the Fuel Cell.

Note: The wires are fragile and can break. Be very careful when disconnecting the solar panel and motor connections. Always grasp them by the plugs, not the wires themselves. If you break off the wire ends, you will need to strip off the red or black plastic end of the wire with wire strippers. Use a small screwdriver to reattach the plug.

5. Generate Hydrogen and Oxygen with Electrolysis

Turn on a 75-watt desk lamp and shine it directly on the solar panel (or use sunlight), and the Fuel Cell should start producing Oxygen and Hydrogen. The gas is produced at such a rate that you can actually see it start to displace the water in the Cell and the tubes at the beginning.

NOTE: Hydrogen is generated more quickly using actual solar energy than it is using artificial light from the bulb. If sunlight is not available, you can use a higher wattage bulb, but you MUST watch the solar panel closely: a higher wattage bulb can overheat and damage your solar panel.

The internal tanks will start to fill with the gases (Figure 9). The outer chamber water level should start to rise as the bubbles of gas increase in size inside the gas tanks. This is when the water will spill out if you put too much water into the chamber at the beginning. You can use the syringe to remove some of the excess water before it spills onto the electrical contacts of the car or the floor. It should take about 10 to 15 minutes to fill the gas tanks under a 75-watt lamp.

6. Connect the Motor and Start the Car!

Once the tanks have some gas in them, you may start the car! Disconnect the red and black wire connections from the solar panel. To power the motor, you must connect the motor to the Fuel Cell, as shown in Figure 10. To do this, plug the red wire from the motor into the same metal strip as the red wire from the Fuel Cell, and plug the black wire from the motor into the same metal strip as the black wire from the Fuel Cell. Make sure that there are no other wires connected to these strips (such as the solar panel wire). You can remove the solar panel from the car entirely to demonstrate that the solar panel is not powering the motor. Make sure you hold the front wheels off the ground when inserting the last power lead, as the motor will start turning when the wire makes contact.

Turn the front wheel assembly to make the car circle, or keep it straight if you want to chase it. Place it on a big table or on the floor and watch it go. A full tank of “gas” will run the motor for 15 to 20 minutes. When you want to stop the car, either let it run out of “gas” or just pick up the front end of the car and then remove one wire from the metal strip to break the connection.

If you need further assistance, please call us at 1-800-587-2872 and ask for Tech Support, or email Tech Support at techsupport@thamesandkosmos.com.

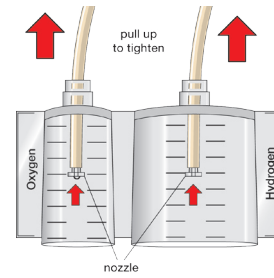


Figure 4

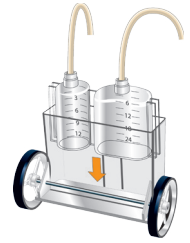


Figure 5

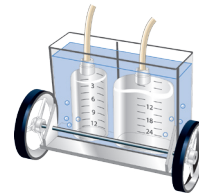


Figure 6

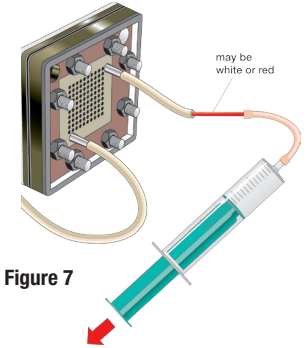


Figure 7

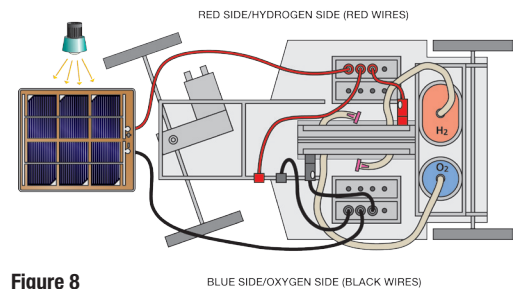


Figure 8

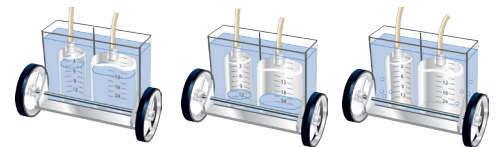


Figure 9 (Note: Outer water level will change as water is displaced by gas. This is not illustrated here)

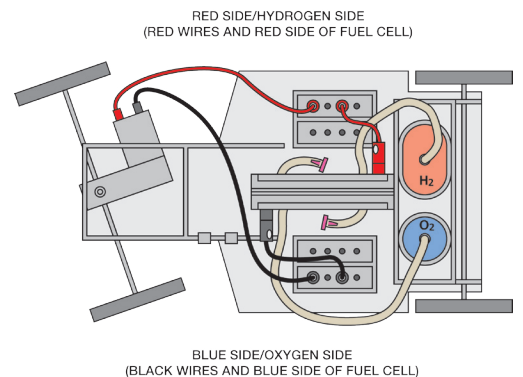


Figure 10

