

# Solar Hydrogen Education Kit

## ASSEMBLY GUIDE



Model No.: FCJJ-16

### Warning

To avoid the risk of property damage, serious injury or death:

This kit should only be used by persons 12 years old and up, and only under the supervision of adults who have familiarized themselves with the safety measures described in the kit. Keep small children and animals away, as it contains small parts that could be swallowed. The fuel cell generates gases that are very easily ignited. Read the instructions before use and have them ready for reference.

### Battery operation instructions:

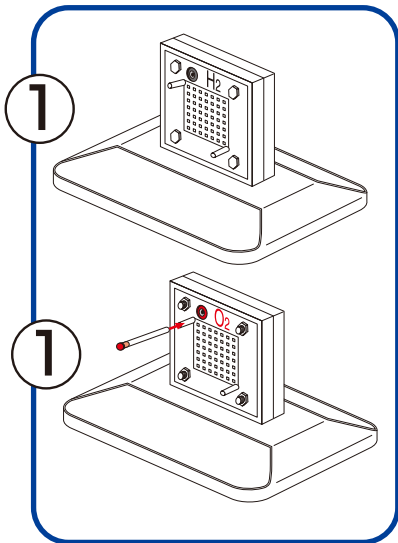
1. The removing and inserting of batteries is to be conducted by the adults only.  
Unscrew the screw holding the battery pack's cover in place using a screw driver. Once the screw is removed open the battery pack and take out the batteries using your fingers. Do not use a metal object.  
When inserting the batteries make sure that you are doing so with the correct polarity (the positive end of the battery must match up with the "+" and the negative end of the battery must match up with the "-" indicated on the battery pack), close the battery pack and secure its cover by tightening the screw with a screw driver.
2. Non-rechargeable batteries are not to be recharged.
3. Different types of batteries such as rechargeable, alkaline and standard batteries or new and used batteries are not to be mixed and should be used separately.
4. The battery pack cables are not to be inserted into an AC socket.
5. The supply terminals of the battery pack are not to be short-circuited.
6. The two spare red&black cables are not to be inserted into an AC socket.
7. Exhausted batteries are to be removed from the battery pack.

**What do you need?** ● SHEK ● AA batteries=2 Units ● Water=50ml ● Scissors

For more detailed description of experimentation possible with this kit refer to the manual provided on CD-ROM.

**IMPORTANT:** Use common sense when connecting the parts described in this guide. Improper connections can cause failure and permanent damage to your equipment.

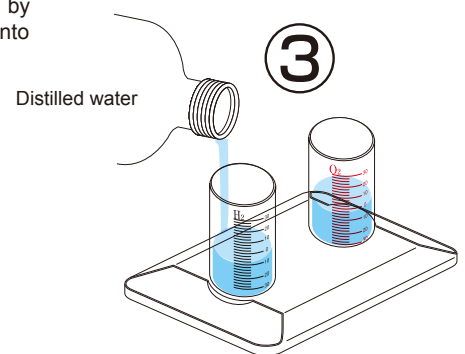
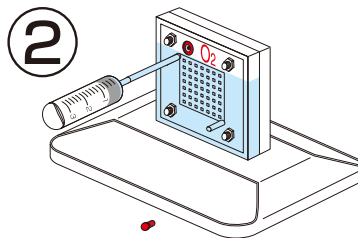
## Preparation of the Electrolyzer Module and Solar Powered Hydrogen Production



**1.** Insert the reversible fuel cell, terminals on top, into the slot on the base. Cut 2 x 4cm length pieces of rubber tube and insert a black pin into the end of one tube. Place the tube with the black pin into the top pin on the hydrogen side (with black terminal). Place the other tube firmly onto the top input nozzle on the oxygen side.

**2.** Fill the syringe with DISTILED water. On the red oxygen side of the reversible fuel cell, connect the syringe to the uncapped tube. Fill the reversible fuel cell until water begins to flow out of the tube. Attach a red plug to the oxygen side tube. Let settle for 3 min.

**3.** Attach the round cylinders to the cylinder base by pressing downward into round slots and twisting into place. Then add water up to the "0" line.



**4.** Place inner containers into outer cylinders minding that the gaps are not blocked by inner plastic rims. Make sure the water is still level to the "0" line. If not, remove some water with the syringe so that water level is at "0" line. Cut the remaining piece of long tubing into two pieces of approximately 20 cm length. Connect the two pieces of tubing to the top nozzles on the inner containers. If the tubing is connected to the inner cylinders last there will be no air trapped inside the inner containers.

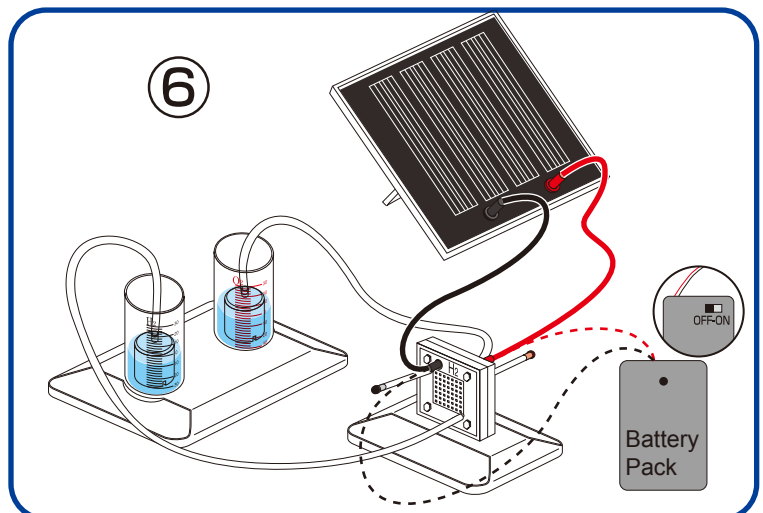
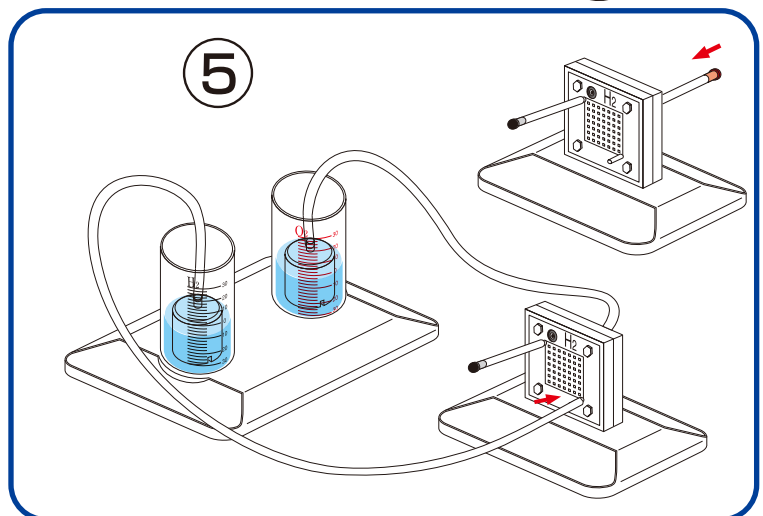
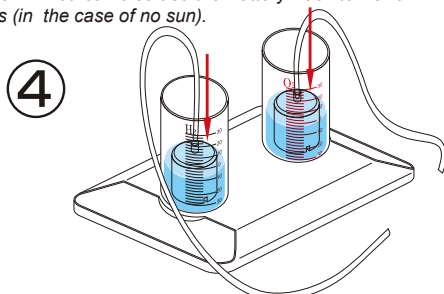
**5.** Connect the other end of the long tube on the hydrogen side to the bottom end of the black hydrogen side of the reversible fuel cell. Connect the other end of the long tube on the oxygen side to the bottom end of the red oxygen side of the reversible fuel cell.

**6.** Connect the reversible fuel cell to the solar panel using the corresponding cables and expose to direct sunlight. (Important: make sure connections are correct or permanent damage can occur.)

The system will now start to produce oxygen and hydrogen in the respective cylinders. When bubbles begin to surface in the hydrogen cylinder the cycle is complete. Disconnect the reversible fuel cell.

Procedure for repeated gas production: Reconnect the solar cell to the reversible fuel cell. Disconnect the small plugs from the tubes connected to the nozzles on the reversible fuel cell. This will allow water into the inner cylinders to replace the gasses and reset water levels to "0" line. Re-insert the plugs into the tubes and repeat electrolysis again.

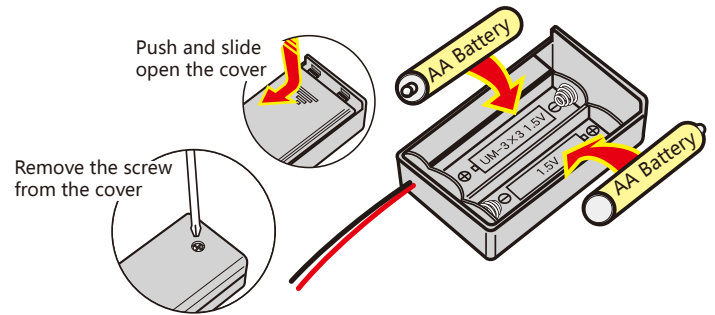
**NOTE:** You can also use the Battery Pack to Perform Electrolysis (in the case of no sun).



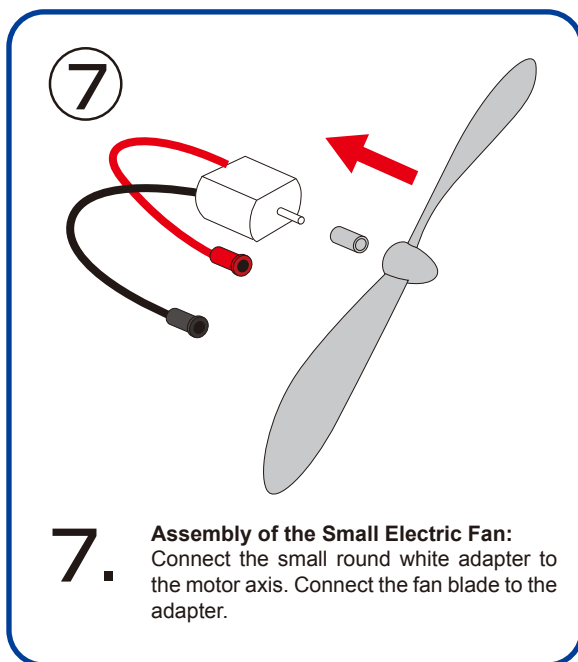
## Using the Battery Pack to Perform Electrolysis (in the case of no sun)

Please remove the screw from cover of battery box using a screw driver.  
 Push and slide the cover and open the battery box.  
 Try NOT to touch the cables when you open the cover.  
 Place two AA batteries as indicated.  
 Push and slide the battery box cover to closed position and screw tightly into place using screw driver.

- ※ Make sure the switch on the battery box is in the "off" position before you place the batteries into the box.
- ※ **WARNING: If the cable is short circuited the batteries inside could become hot and potentially cause burns, melting of parts, or create risk of fire.**
- ※ *Note: Battery's energy may be consumed after 4-5 times of use.*
- ※ *Make sure to connect the black cable to the black plug, the red cable to the red plug on the fuel cell.*

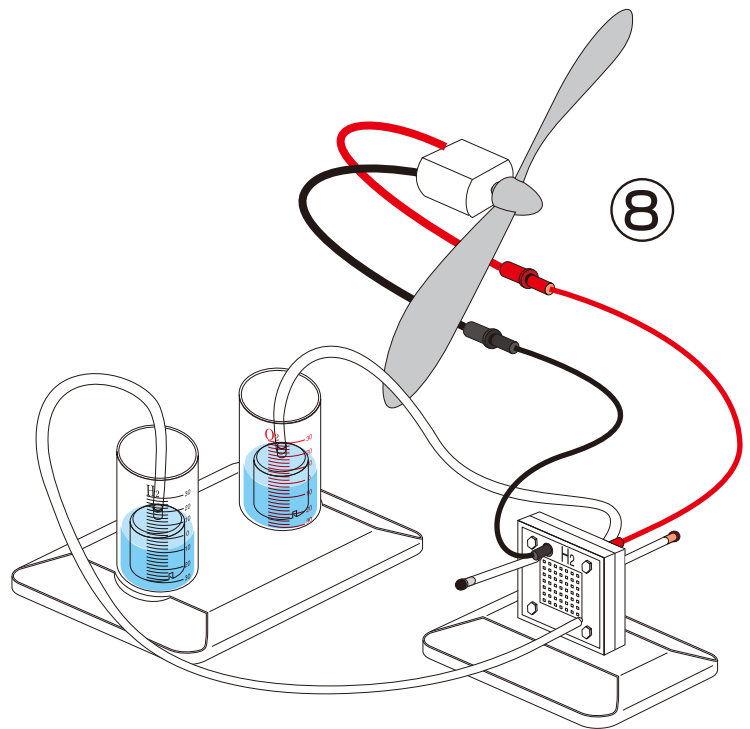


## Using a Reversible Fuel Cell to Power the Small Motor with Fan Blade



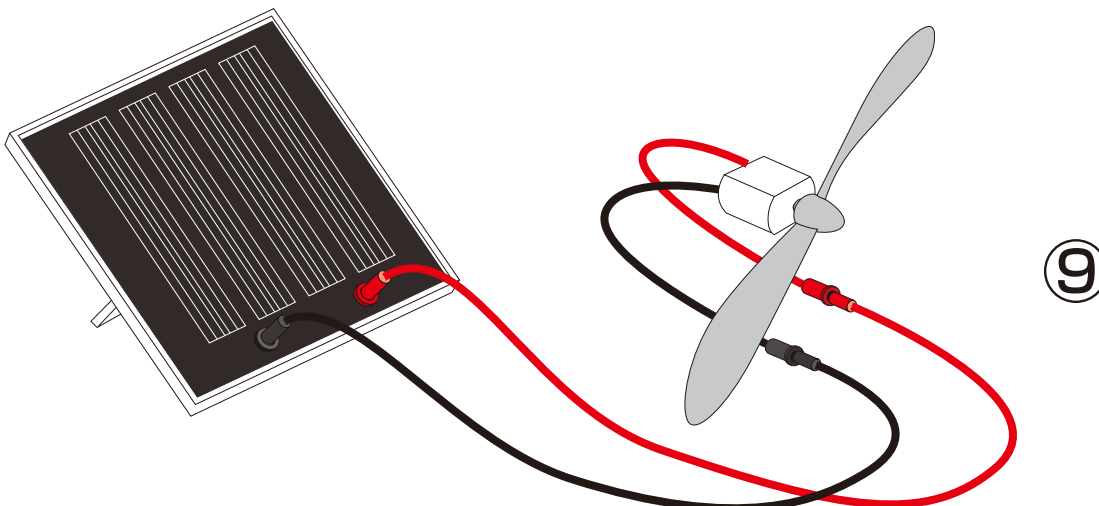
- 7. Assembly of the Small Electric Fan:**  
 Connect the small round white adapter to the motor axis. Connect the fan blade to the adapter.

- 8.** Connect the motor to the reversible fuel cell using the cables as shown. The motor should begin to turn and consume the hydrogen and oxygen gases stored in the cylinders. The fan may need to be flicked with your finger to start.



## Using a Solar Panel to Power the Small Motor with Fan Blade

- 9.** Connect the solar panel to the small motor with fan blade using the cables as shown. The motor should begin to turn if there is sufficient sunlight available. The fan may need to be flicked with your finger to start.



# SOLAR HYDROGEN EDUCATION KIT

## TECHNICAL SUPPORT

1. The water levels do not drop when the gas outlet tubes on both sides of the reversible fuel cell are unplugged.

Solution:

Check whether the holes on the wall of the inner cylinder are blocked. If so, turn the inner cylinder until water enters the holes and fills up the inner cylinder.

2. The reversible fuel cell does not produce hydrogen and/or oxygen.

Solution 1:

Check whether the wires are appropriately connected, and whether there are any loose connections. The reversible fuel cell could be completely destroyed if the red wire of the battery pack is connected to the black jack of the reversible fuel cell.

Solution 2:

Make sure the batteries are inserted with the correct polarity.

Solution 3:

Replace the old batteries with new one in the battery pack.

3. The water electrolysis process slows down.

Solution 1:

Inject water to the oxygen side of the reversible fuel cell by using the syringe and wait for about 3 minutes.

Solution 2:

Replace the old batteries with new one in the battery pack.

4. The motor does not run while there is hydrogen left in the inner container.

Solution:

Unplug the black pin of the short tube on the reversible fuel cell and quickly attach the pin back to the tube to purge out impure gases. You should then see the motor begin to turn again.

5. No hydrogen is produced under the sunlight.

Solution:

If the sunlight is not strong enough electricity will not be created. Use the battery pack provided to perform the electrolysis using the reversible fuel cell.