OHM'S LAW USING A FUEL CELL

LAB ELEC 1.FUELCELL

From *Intelligent Fuel Cell Car, Fuel Cell Store.Com*

INTRODUCTION

George Simon Ohm was a Bavarian physicist who is credited for developing the mathematical formulas for electrical current. Ohm's law recognizes the relationship between voltage, current and resistance. When we measure electricity we usually denote current as amperes and resistance as Ohms.

Working with Ohm's law we can define the amount of electrical power being produced. Power is measured as Watts.

Single slices of fuel cells can produce only about 0.85 volts. The amount of current depends primarily on the area and the amount of catalyst on the Proton Exchange Membrane (PEM). Fuel cell manufacturers design fuel cells based on the user's requirements for volts, watts and amps by varying the size of the fuel cell and the number of fuel cell slices in a fuel cell stack.

PURPOSE

To calculate the number of watts being produced by your fuel cell using equations derived from Ohm's law.

PRE-LAB QUESTIONS

1.What is Ohm's Law?

2. What equations will you use to calculate watts if you have measurements in volts and amps?

MATERIALS

Multi-meter
Distilled Water (100ml)
Syringe
Battery pack
PEM Fuel Cell & car (assembled)

SAFETY

1. Obey instructions of the teacher explicitly!
2. Protect your eyes! Use safety goggles.
3. Never work around sparks or flames. Hydrogen in the presence of oxygen is extremely flammable.
4. Turn off the battery pack when not in use. When pack is on, do not allow the metal leads to touch; this will cause the battery to over heat. Remove batteries during storage.

PROCEDURE

1. Using the syringe, push water into the hydrogen side of the fuel cell until you see water filling half way up the chamber. Remove the syringe and plug the tube. Repeat this on the oxygen side. ***DO NOT OVERFILL.*** The gas needs to be able to climb the screen in the fuel cell in order to reach the storage cylinder.
2. Be sure the two notches at the bottom of each inner cylinder are not blocked. Fill the storage cylinders with distilled water to the zero mark.
3. Attach the long tube from the top of the hydrogen cylinder to the upper nozzle on the hydrogen side of the fuel cell. Repeat for the oxygen cylinder. If assembled correctly the tubes will cross at the top of the car.
4. Attach the plug from the battery pack into the power jack on the front of the car chassis. Insert the red and lack wires from the power jack into the red and black banana jacks on the fuel cell.
5. You will know gas is being produced when water is displaced to the top of the storage cylinders.
6. When the hydrogen cylinder is filled, you will see bubbles released from the top of the cylinder. Turn the battery pack off. Unplug the wires from the fuel cell and unplug the power pack from the front of the fuel cell.
7. Prop the car chassis between two blocks of wood or two books so the motor is able to run without the car moving.
8. Attach the wires from the chassis to the fuel cell. Insert the red wire into the red banana jack and the black wire into the black banana jack. ***(Note: IF YOU REVERSE THE RED AND BLACK WIRES YOU WILL DESTROY THE FUEL CELL)***
9. Turn the multi-meter dial to measure current in the 200mA range. Touch the red lead to the screw at the back of the red banana jack on the fuel cell. At the same time, touch the black lead from the multi-meter to the screw at the back of the black banana jack on the fuel cell. Record the number of mA being produced.
10. Turn the dial on the multi-meter to measure volts in the .200 range. Touch the red lead to the screw at the back of the red banana jack on the fuel cell. At the same time, touch the black lead to the screw at the back of the black banana jack on the fuel cell. Record the number of volts produced.

QUESTIONS

3. How many amps is the fuel cell producing?

4. How many volts are being produced?

5. Calculate the watts being produced.

6. If you have a fuel cell that produces .85v at 2w, how many amps is the fuel cell producing?

7. A single fuel cell produces .50v, how many fuel cells would be needed to stack together to run a radio that requires 6 volts?