



**CALIFORNIA STATE SCIENCE FAIR
2004 PROJECT SUMMARY**

Name(s) Nicole L. Corlett	Project Number J0707
Project Title Does Temperature Affect the Performance of a Fuel Cell?	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals The objective of this project is to determine if temperature has an affect on the performance of a fuel cell.</p> <p>Methods/Materials Materials: Thames and Kosmos Fuel Cell Car and Experiment Kit; distilled water; Beckett waterfall pump, Model Number G235AG20; digital multi-meter; 1/8 inch polyethylene tubing; digital infrared thermometer; stopwatch; misc. plumbing fittings; adult supervision.</p> <p>Procedure: The first step is to characterize the solar cell to develop a characteristic curve, determine how much power is generated, and determine the efficiency of the solar cell. The second step is to characterize the electrolyzer function of the fuel cell by determining the presence of hydrogen and oxygen, measuring the amount of gas generated, and determining the efficiency of electrolysis. The next step is to characterize the fuel cell by measuring the generated voltage and measuring no-load voltage, operating voltage, and short-circuit current. The last step is to determine the effects of temperature on the performance of the electrolyzer/fuel cell. This is accomplished by regulating the temperature of the supply water to the fuel cell in the electrolyzer function and the temperature of the supply gases in the electricity generation mode. For three temperatures (warm, room temperature and cold), determine the time required to fill the hydrogen and oxygen tanks, the temperature of the fuel cell and supply water/gas, and the elapsed time to run the fuel cell out of fuel.</p> <p>Results As expected, electrolysis was completed in 18 minutes and 9 seconds using warm water for heat transfer, while electrolysis was completed in 20 minutes using room temperature water and 22 minutes using cold water for heat transfer. Generation of electricity from the fuel cell follows closely with the time required to generate and store the hydrogen and oxygen gases, about 18 minutes using warm gases and about 22 minutes using cool gases.</p> <p>Conclusions/Discussion Based on the data, one can state that temperature does affect the performance of a fuel cell. The electrolysis process in a fuel cell is completed faster when the water entering the electrolyzer/fuel cell is warm rather than cold. Similarly, the generation of electricity with a fuel cell takes longer when the gases entering the fuel cell are cold rather than warm.</p>	
Summary Statement My project is to determine the affect that temperature variations have on the performance of a fuel cell.	
Help Received Received advice and suggestions from Mr. John Del Frate of NASA and Mr. Dale Ritter; Adult supervision and financial support fom Father; Mother helped with preparation of the display board.	