



**CALIFORNIA STATE SCIENCE FAIR
2005 PROJECT SUMMARY**

Name(s) Michelle E. Jaconette	Project Number J0517
Project Title pH: It's to DYE for!	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals My project was to determine the optimum pH for dyeing 100% cotton cellulose fabric using fiber reactive dyes. I believe that the high pH dye solutions will produce results with a more intense color on the fabric than the low pH dye solutions.</p> <p>Methods/Materials 54 cups of dye solution were prepared. There were six colors of dye and the solutions for each color ranged from pH 5 to pH 13. The low pH solutions were made using distilled vinegar and water and the high pH solutions were made using sodium carbonate dissolved in water. The pH of each solution was tested with litmus paper before adding a measured amount of dichlorotriazine dye powder. 54 squares of 100% cotton cellulose fabric were cut and labeled, then soaked for five hours in each of the dye solutions. Then the squares were rinsed individually in tap water, then run through a washing machine using a mild detergent. They were then air dried, mounted and compared for color intensity, both qualitatively and quantitatively. It was important for me to wear latex gloves and safety goggles because sodium carbonate is toxic.</p> <p>Results The optimum pH solution for dyeing 100% cellulose cotton fabric is pH 12. The higher pH solutions produced the most intense colors on the fabric, and the lower pH solutions produced uniformly less intense colors on the fabric.</p> <p>Conclusions/Discussion My results show that the chemical reaction taking place between the dye and the fabric is enhanced at a high pH and suppressed at a low pH. The reaction that takes place is that a nucleophilic cellulosate anion attacks the carbon to which one of the chlorine atoms in the dichlorotriazine dye is attached. After the chlorine atom is displaced, a covalent bond results between the dye and the fiber.</p>	
Summary Statement My project is about studying pH as a variable in the efficacy of fiber reactive dyes.	
Help Received My mom helped by cutting out and labeling numerous cotton fabric squares. My dad helped by teaching me how to make data tables and graphs using Microsoft Excel on the computer. My teacher helped by supplying me with the fiber reactive dyes and the sodium carbonate.	