



**CALIFORNIA STATE SCIENCE FAIR  
2007 PROJECT SUMMARY**

<b>Name(s)</b> David M. Marangoni-Simonsen	<b>Project Number</b> <b>S0508</b>
<b>Project Title</b> <b>Reaction Rates</b>	
<b>Objectives/Goals</b> The goal of my experiment was to discover if temperature effects the rate of a reaction. My hypothesis was that if temperature is raised or lowered, then the reaction rate will respectively, increase or decrease. In case my hypothesis was validated, I also wanted to see if there was a function that could relate the reaction rate to the temperature of the reaction.	
<b>Abstract</b> <b>Methods/Materials</b> Clean test tubes, Spectrum 20, Bucket of Ice, Chamber of 75°C water, Copper (II) Chloride in Crystal Form, Distilled Water, Iron Nails, Centrifuge, 3 test tube holders, Ammonia, Repeating pipette, Beakers.  15. Create 42 test tubes, half .0625M and half .125M. 16. Separate the tubes into groups of 7. 17. Designate one group to be placed into the ice bucket, another to be placed in the hot water, and for another to be used as a room temperature control and place nails into each holder with different time intervals. 20. When time is up, remove the nails and place the test tube into a holder. 21. After all reactions have finished, place each test tube into a centrifuge. 22. Use a repeated pipette to squirt 1 ml of ammonia into each test tube. 24. Now measure the absorbance of each test tube with the Spectrophotometer.	
<b>Results</b> I first graphed these results and discovered that temperature does significantly affect the rate of a reaction. I now could interpret this data to create an equation. I primarily used the Arrhenius equation to interpret my results. I then tweaked this equation to form a linear, rather than exponential function. I could use this equation to form linear systems of each time interval. I then used the points of each interval to form a linear equation. Next, I used the average values for both the .125M and .0625M to allow me to determine the activation energy, and gas constant. This allowed me to input the constants and create two equations. $k(.125M)=1.177e^{(-73.5/T)}$ $k(.0625M)=1.108e^{(-28.94/T)}$	
<b>Conclusions/Discussion</b> The experiment was successful as it proved my hypothesis and established an equation. Heating or cooling does increase or decrease the rate of the reaction by an amount which can be determined by an equation. The main flaw which could have influenced my results was the time the nails spent in each test	
<b>Summary Statement</b> My project was designed to find the effect temperature has on the rate of a reaction.	
<b>Help Received</b> Parents helped construct board; Dr. Galindo taught me how to use all the necessary equipment	