



**CALIFORNIA STATE SCIENCE FAIR
2016 PROJECT SUMMARY**

Name(s) Ryder J. Wittman	Project Number J0635
Project Title What Effect Does Temperature Have on the Rate of Reaction?	
Abstract Objectives/Goals The objective of this project is to determine what affect temperature has on the rate of a simple chemical reaction. Methods/Materials 3 clear glass cups, a measuring cup, white distilled vinegar, baking soda, one-eighth teaspoon measuring tool, a thermometer and a stopwatch. One cup of vinegar taken to one of three temperatures (45, 70 and 118 degrees Fahrenheit). One-eighth teaspoon was then added to each cup of vinegar and the reaction was timed with a stop watch until no the chemical reaction ended (the end of gas bubble production). This was done three times for each temperature and then averaged. Results It was determined that the reaction times where faster as the temperature increased. The average reaction time at 45 degrees was 194 seconds, 70 degrees was 44.66 seconds, and 118 degrees was 13.85 seconds. Conclusions/Discussion The experiment clearly demonstrates that increasing the temperature also increases the speed of this reaction thus decreasing the time it takes for the reaction to occur. Increasing the temperature increases the average kinetic energy of particles involved in the reaction. It was also discovered that most reactions depend on thermal activation (activation energy), which is the fraction of molecules that possess enough kinetic energy to react at a given temperature. As the temperature increases the number of molecules that possess the necessary kinetic energy to react also increases so the speed of the reaction also increases.	
Summary Statement I discovered that speed of the chemical reaction of baking soda with vinegar increases as you increase the temperature of the reactants.	
Help Received I designed and completed the experiments myself, my father purchased the materials and helped to show me how to make a graph on the computer.	