



**CALIFORNIA STATE SCIENCE FAIR
2009 PROJECT SUMMARY**

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Project Title Impact of Extrinsic and Intrinsic Factors on the Rate of Reactions	
Abstract Objectives/Goals A chemical reaction happens if two or more reactants can collide with each other. They can be slowed down with an inhibitor and sped up with a catalyst. Reactions also speed up if the energy in which they collide increases. The purpose of the experiments was to analyze the effect of different factors on the rate of chemical reactions. The goal was to take different chemical reactions and vary the settings one at a time such that the reaction rate could be determined. A series of separate experiments had to be done to look at each factor (temperature, particle size, concentration, pressure) individually. Methods/Materials The basic reactions tested were dissolution of Alka-Seltzer tablets or baking soda (NaHCO_3) in H_2O or vinegar, or Zinc with hydrochloric acid (HCl). Different conditions were tested to determine the effect of temperature, particle size, concentration of the reactants, pressure, and mechanical stirring on the rate of these reactions. The Pasco Xplorer GLX was used to confirm the experiments with a different method. Results My experiments show that the rate of reaction varies considerably. Increased temperature, higher concentrations of the reactants, active stirring, larger surface (smaller particles) all increased the rate of the reaction; higher pressure reduced the rate of the reaction during which gas was formed. Catalysts accelerated the reaction as long as an optimal temperature was maintained. Conclusions/Discussion My experiments show that factors increase the reaction rate if they either increase the statistical chance for the reactants to come together, or if they improve the contact.	
Summary Statement I looked at different aspects of reaction rates by using different settings and tools, changing 1 parameter at a time.	
Help Received Teachers helped with the experiments, parents helped with the practical construction of the board.	