CALIFORNIA STATE SCIENCE FAIR
2009 PROJECT SUMMARY

Name(s)
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Project Number
S0429

Project Title
How Does Temperature and Concentration Affect Enzyme Catalyzed Reactions?

Abstract

Objectives/Goals
The objective of this experiment was to test how the temperature of a substrate and the concentration of a catalyst affect the rate of enzyme-catalyzed reactions. I hypothesized that if the temperature of the substrate increases, then the rate of the reaction will also increase and that if the concentration of the catalyst increases, then the rate of the reaction will also increase.

Methods/Materials
In this experiment I used hydrogen peroxide for the substrate and catalase for the catalyst. In addition, beakers, pipettes, filter paper discs, potatoes, water, ice, a graduated cylinder, a cooler, a scale, a thermometer, and a stop watch were used. To begin the experimentation I prepared the catalase from the potatoes. Next, I soaked filter paper discs in the catalase and then placed the disc into a beaker of hydrogen peroxide, because of the chemical reaction that occurred the filter paper disc rose to the top of the beaker. I repeated this step with different temperatures of hydrogen peroxide and different concentrations of catalase, and then compared results. The speed at which the disc rose, acts as an indirect measure of the rate of the reaction.

Results
I found in my experimentation that as the temperature of the substrate increased, the rate of the reaction increased, becoming quicker. Also, I found that as the concentration of the catalyst increased, the rate of the reaction increased, becoming quicker.

Conclusions/Discussion
Through experimentation, I was able to prove my hypothesis to be true. As the temperature of the substrate increases, the rate of the reaction increases. This occurred because when the substrate is hotter, there is more energy in the reaction and the necessary activation energy to begin the reaction can be obtained more quickly. It was also proven true that as the concentration of the catalyst increases, the rate of the reaction increases. Enzymes are reusable protein binding sites, so at a higher concentration, more enzymes exist in the reaction and more proteins are available for the substrate to bind to.

Summary Statement
This experiment tests how certain factors affect the rate of enzyme catalyzed reactions.

Help Received
Sister taught me how to use a pipette, father took pictures and helped time the trials.