CALIFORNIA STATE SCIENCE FAIR
2011 PROJECT SUMMARY

Name(s)

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Project Number

31844

Project Title

Enzyme Catalyzed Reactions: What Affects Their Rates, What Inhibits It?

Abstract

Objectives/Goals

My goal was to evaluate the reaction rate of enzyme catalyzed reactions such as the breakdown of hydrogen peroxide into oxygen and water(2H202------>H20+02) under different substrate temperatures and different enzyme catalase concentrations. I also wanted to see the effects of copper sulfate inhibitor on the rate of reaction.

Methods/Materials

To measure enzyme activity in breaking down the hydrogen peroxide, I observed the release of oxygen, which is proportional to the rate of reaction. I did this by first immersing a filter disk in catalase extract(filtered from potato tubers), and then placing the disk into a beaker with 3% hydrogen peroxide. The oxygen released from the breakdown, caused the disk to rise and float. The time, from the initial placement, to the final rise, is inversely proportional to the reaction rate. I conducted over 75 trials, with variations(5 trials per variation), of temperature, enzyme concentration, and inhibitor concentration.

Results

The rate of reaction increased by increasing temperature of the substrate, and by increasing enzyme catalase concentration. I also noticed decrease reaction rate by increase of copper sulfate concentrations, until the reaction rate stopped at 0.05g of copper sulfate solution.

Conclusions/Discussion

Study of the variables of temperature, enzyme concentration, helped to achieve optimum level of enzyme activity. Adding inhibitors also demonstrated the competitive effect of certain metal ion solutions on enzyme activity. This emphasized the importance of these variables to control enzyme reactions which could be used in food processing, health care and other applications.

Summary Statement

Evaluating enzyme activity under different substrate temperatures, enzyme concentrations, and inhibitor concentrations

Help Received

Father helped to supervise and order the supplies and instruments; Mother helped with board.

Preliminary