CALIFORNIA STATE SCIENCE FAIR
2017 PROJECT SUMMARY

Name(s)

Kalin S. Baca

Project Number

J0602

Project Title

Enzyme, Break It Down! How Does Temperature Affect the Rate of Reaction of Catalase?

Abstract

Objectives/Goals

The goal of my project is to test the optimal temperature conditions for catalase activity.Since the human body's internal temperature is normally 37C, I hypothesized that catalase will breakdown hydrogen peroxide at an optimal range temperature range of 35-40C.

Methods/Materials

I extracted catalase from potatoes and indirectly measured its activity when exposed to hydrogen peroxide of different temperatures.To measure enzyme activity,I saturated filter paper with catalase solution and exposed it to hydrogen peroxide in a beaker. Intially,the filter paper sunk to the bottom of the beaker.As catalase broke down hydrogen peroxide to water and oxygen, the filter paper rose to the surface. I recorded the amount of time it took for the paper to sink and rise to the surface and used this time as an indirect measurement of catalase activity. I used the basis of this protocol from an online source,sciencebuddies.org. I modified the protocol for more rigorous testing,for example,I used a pipette to measure the amount of catalase in the paper.Some materials used include: scale,thermometer,beakers,flasks,P1000 pipette with tips,forceps,distilled water,potatos,3%Hydrogen Peroxide,filter paper, ice.

Results

Results of the experiment show that catalase had a shorter reaction time when its substrate's temperature was well above body temperature.The shortest average reaction time of 6.17sec was observed at hydrogen peroxide at 55C. The longest average reaction time of 35.92sec was observed at hydrogen peroxide at 3C.

Conclusions/Discussion

Results indicate that catalase reactivity is directly related to the temperature of hydrogen peroxide. However, there is a limit to how much heat catalase can be exposed to before it is denatured. At 60C, there was no observed activity, indicating that catalase is denatured. Results show a 6-fold increase in reaction time when catalase is exposed to hydrogen peroxide from 3-55C. That's an observed reaction time that is close to 600% times faster!

Summary Statement

I investigated the role of temperature to enzymatic activity.

Help Received

I performed the experiment myself. I modified the protocol of this experiment from sciencebuddies.org. I got help with experimental design, plotting of graphs on Word, proofreading of final report from Miriam Baca.