CALIFORNIA STATE SCIENCE FAIR
2006 PROJECT SUMMARY

Name(s)
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Project Number
J0402

Project Title
How Does Temperature Affect the Reaction Rate between Catalase and Hydrogen Peroxide?

Abstract

Objectives/Goals
My objective was to learn how certain temperatures affect the decomposition reaction of Hydrogen Peroxide.

Methods/Materials
First, I extracted catalase from potatoes. Then, I soaked a filter disc in the beaker with the catalase. I filled another beaker with hydrogen Peroxide and placed both beakers in a water bath. When the Hydrogen Peroxide and Catalase got to the desired temperature, I used tweezers to take out the filter disc from the beaker with the catalase and inserted the disc into the beaker with the hydrogen Peroxide. I timed how long it took for the disc to rise to the top of the hydrogen peroxide. I also measured the height of the Hydrogen Peroxide and divided the height(cm) by the time it took the filter paper to rise(sec).

Results
I found out through this experiment that as the temperature increased, the speed of the decomposition reaction varied. Between ten and fifteen degrees celcius, there was no reaction. Then from fifteen to twenty-five degrees celcius, there was a lot of reaction, because the molecules could bind together, therefore producing a great amount of reaction. At thirty degrees celcius, the speed that the filter paper rose decreased. This was the outlier of my experiment. At thirty-five degrees, the average speed of the filter disc rose to 0.246 cm/sec. At forty-five degrees, the reaction was slowing down to 0.159 cm/sec, because the enzymes were starting to denature. And at fifty degrees celcius, the enzymes were denatured completely, so there was no reaction at all.

Conclusions/Discussion
The results I got support my hypothesis, however there was an outlier in my results. At thirty degrees celcius, the reaction rate slowed down, when it should've sped up. I think I got this outlier because I reused the catalase and hydrogen Peroxide that I had done another trial with.

In this experiment, I learned that catalase is an enzyme that makes chemical reactions go faster. I learned how enzymes work and how they react to certain temperatures. When you first expose enzymes to a cold temperature, they don't do much, however as you continue to increase the temperature, there is more kinetic energy, therefore more reaction. However, around forty-five degrees celcius, the enzymes slow down because they start to loose their native forms and denature. At fifty degrees celcius, the enzymes are denatured completely, so there is no reaction at all.

Summary Statement
My project investigates the relationship between the temperature of catalase used in a decomposition reaction and the rate of the reaction.

Help Received
Mother helped me by holding the thermometers in place