

Research et al.).
nonetheless, this
does not



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Research Question: What effects does different concentrations of hydrogen peroxide (0%, 5%, 10%, 15%, 20%, 25%, 30%) have on time taken for 20cm³ of oxygen to be made? Background Information: Enzymes are proteins that function as catalysts for chemical reactions that occur in living cells.

An individual enzyme can only accelerate the reaction of only one chemical reaction (Mäntsälä et al.). Nonetheless, this does not limit their ability speed up the reactions in cells. An example by Mäntsälä et al.

which was related to the investigation stated that " In the presence of catalase, the decomposition of H₂O₂ occurs 108 times faster than in the absence of catalase". Catalase is a common enzyme found in nearly all aerobic cells. It accelerates the decomposition of hydrogen peroxide into water and oxygen (Chelikani, P., et al). Catalase is extremely important in cells because it prevents the accumulation of hydrogen peroxide produced as a by-product of cell metabolism. Because hydrogen peroxide is a strong oxidizing agent, it disrupts the cell chemistry (Nindl et al.) and it will kill the cell so catalase quickly neutralizes it before damage is done.

It does this by catalyzing the decomposition of hydrogen peroxide into molecular oxygen and water. (Student sheet 24). The chemical equation for this reaction being: $2 \text{H}_2\text{O}_2 \longrightarrow 2 \text{H}_2\text{O} + \text{O}_2$ It's also significantly important because catalase has one of the highest turnover numbers of all enzymes which essentially means that one catalase molecule can convert millions of molecules of hydrogen peroxide to water and oxygen each second.

Thus, catalase is most effective at degrading high concentrations of hydrogen peroxide (J. P.

Kehrer et al.) Reactions of catalase similar to other enzyme reactions can be manipulated by a variety of factors such as pH levels, temperature, inhibitors... This experiment is designed to focus purely on the effect of substrate concentration on the rate of catalase reaction. Aim: In this assessment, the rate of catalase reaction by substrate concentration will be explored.

This is achieved by having the catalase react to varying degrees of hydrogen peroxide concentration (0%, 5%, 10%, 15%, 20%, 25%, 30%) and timing how long it takes to produce 20cm³ of oxygen. Being a student who didn't do the GCSE and DP1 of IB Biology, I have certainly missed out a lot on what I consider as biology basics. This investigation does not only serve as a way for me to connect with old concepts but also allow me to look at one of the things I was amazed at Biology. In my first few encounters with the subject, what amazed me was the revelations that millions of tiny interactions that takes place beyond normal vision.

If catalase can convert millions of molecules, I want to 'see' this process of enzyme reactions in real time. Hypothesis: Based on background information, it will highly be that as the concentration of hydrogen peroxide increases, the time taken for 20cm³ of oxygen to form will decrease. So inversely the rate of reaction between the catalase and hydrogen peroxide will increase. Due to the fact that as substrate concentration increases, more enzyme-substrate complexes will be formed and as a result there will be fewer hydrogen

peroxide molecules that are free, thus causing the rate of reaction to increase at a slower rate and eventually plateau.