

# [Research et al.). nonetheless, this does not](https://assignbuster.com/research-et-al-nonetheless-this-does-not/)

Research Question: What effects does different concentrationsof hydrogen peroxide (0%, 5%, 10%, 15%, 20%, 25%, 30%) have on time taken for 20cm3 ofoxygen to be made?   Background Information: Enzymesare proteins that function as catalysts for chemical reactions that occur inliving cells.

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

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

It does this by catalyzing the decomposition of hydrogen peroxide intomolecular oxygen and water. (Student sheet 24). The chemical equation for thisreaction being: 2 H2O2 ———–> 2 H2O + O2 It’salso significantly important because catalase has one of the highest turnovernumbers of all enzymes which essentially means that one catalase molecule canconvert millions of molecules of hydrogen peroxide to water and oxygen eachsecond. Thus, catalase is most effective at degrading high concentrationsof hydrogen peroxide (J. P.

Kehrer et al.) Reactionsof catalase similar to other enzyme reactions can be manipulated by a varietyof factors such as pH levels, temperature, inhibitors… This experiment isdesigned to focus purely on the effect of substrate concentration on the rateof catalase reaction.  Aim: Inthis assessment, the rate of catalase reaction by substrate concentration willbe explored.

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

If catalase can convert millions of molecules, I want to ‘ see’this process of enzyme reactions in real time. Hypothesis: Basedon background information, it will highly be that as the concentration ofhydrogen peroxide increases, the time taken for 20cm3 of oxygen to form will decreases. So inversely the rate of reaction between the catalase and hydrogen peroxidewill increases. Due to the fact that assubstrate concentration increases, more enzyme-substrate complexes will beformed and as a result there will be fewer hydrogen peroxide molecules that arefree, thus causing the rate of reaction to increase at a slower rate andeventually plateau.