

Ieuan halliday.

## **How much oxygen is produced with different concentrations of hydrogen peroxide.**

### **Plan**

We wanted to know how much catalyse is present in a king Edward potato.

In this experiment I will use hydrogen peroxide as the catalyst. I will be using different concentrations of the hydrogen peroxide, to deter which concentration will have the quickest rate of reaction. The hydrogen peroxide will be mixed with different amounts of water starting with 5cm of hydrogen peroxide and 15cm of water. The two different amounts will always add up to 20cm to ensure that the test is fair. When the reaction happens the oxygen that has been given off will be collected in a burette, which will be full of water up to 50cm. I will then be able to measure off the amount of oxygen collected, as the oxygen will rise up through the burette. The burette will be placed vertical in a trough full of water so that when oxygen is taken up to the burette the water that it has pushed downwards will go into the trough of water and not the floor, the water in the trough will also stop water from leaking from the burette. I will get a stand, boss and a clamp to hold up the burette, around the burette where the clamp will be holding it I will wrap paper towels around to make sure that the burette doesn't smash if tightened to hard. When I put the hydro peroxide and water into the conical flask with the potatoes I will quickly put a bung in the conical flask with a tube leading to the burette. I will have to do this quickly so that no oxygen leaks out. I will use king Edward potatoes through out the experiment to keep it fair. The amount of water in the burette will also be kept constant so that I will be able to read the results more clearly each time.

### **Diagram.**

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Enzymes are proteins that act as catalysts, they are made in cells. A catalyst is something that speeds up a reaction but they never die so after they have decomposed a molecule they can move on to do another, they can only get denatured which is when they can't decompose any more. One can usually be used many times. Catalyse is an enzyme present in foods such as potatoes and livers, it speeds up the rate of reaction. Catalyze speeds up the decomposition of Hydrogen Peroxide and breaks it down into water and oxygen. It can speed up the decomposition of Hydrogen Peroxide because of the shape of the Hydrogen Peroxide molecule. It is specially designed too lock into the molecules as fisher's model shows. This type of reaction where a molecule is broken down into smaller pieces is called an anabolic reaction.

This is represented in Fischers model. It shows the hydrogen peroxide and amylase in the potato reacting to form the sugar.

### **Fischer's model**

### **Fair experiment.**

To ensure that I keep the experiment the fair I will take a number of precautions. The only variables in the experiment will be that of the different amounts of hydrogen peroxide and water.

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1. I will do the experiment in the same science lab, as others may vary in temperature, which may cause my results to be different, as the reaction will take place quicker in a hotter room.
2. I will use the same type of potato, which in this case will be a king Edward. Other potatoes may have different types of enzymes and react at different speeds.
3. I will be timing them for the same amount of time.
4. I will use the same type of cork borer so that the chips are the same width, then I will cut them to an exact length of 3cm so that there is the same amount of area for the reaction. If the surface area were changed then the results would be drastically changed.
5. I will repeat each different amount of water and hydrogen peroxide three times so that I will be able to take an average.
6. After each experiment I will refill the burette so that there is always 50cm of water in it before each individual test.
7. The volume of hydrogen peroxide will be measured so that it is the right amount every time.
8. I will keep the volume of the hydrogen peroxide the same

### **Measurements.**

The different concentrations are;

- 1 vols (1cm<sup>3</sup> of hydrogen peroxide+19cm<sup>3</sup> of water.)
- 5 vols (5cm<sup>3</sup> of hydrogen peroxide+15cm<sup>3</sup> of water.)
- 10vols (10cm<sup>3</sup> of hydrogen peroxide+10cm<sup>3</sup> of water.)
- 15vols (15cm<sup>3</sup> of hydrogen peroxide+5cm<sup>3</sup> of water.)
- 20vols (20cm<sup>3</sup> of hydrogen peroxide+0cm<sup>3</sup> of water.)

I am using this range of measurements as they are fairly broad, if they were closer e.g. 19cm of hydrogen peroxide+1cm of water, 18cm of hydro peroxide+2cm of water. With that information a graph would no show clearly the change in concentration.

### **Prediction.**

I predict that the higher the concentration of hydrogen peroxide there is then more oxygen will be produced in 1 minute. Because there will be more chance of a reaction with the potatoes as there will be more hydrogen peroxide atoms in the mixture that may collide with the potato and react. Although as I am not heating the mixture in the

experiment the atoms may not have enough energy to react with the potato very often. The water will not react with the potato at all so that is why I am predicting this.

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### **Equipment list.**

We will be using;

Conical flask,  
Trough,  
Clamp,  
Boss,  
Stem,  
Tube bung,  
Cork borer,  
Potato.

### **Results.**

	Oxygen produced (cm)				
Hydrogen peroxide concentration	1	2	3	Average	Rate (cm /sec)
5	4	4.5	3.5	4	0.13
10	8	8	7	7.7	0.256
15	12	11.5	11	11.5	0.383
20	16	17.5	17	16.8	0.56
1	0.5	1	1.5	1	0.03

### **Safety.**

Although the risk of getting hurt or causing any damage to anything is fairly minimalistic we will be using safety glasses. These will stop any spitting hydro peroxide from getting into our eyes; if it does spit we will clean up the mess immediately to stop anyone from putting any part of their body in it. When pushing down to get the bung in the conical flask we will make sure we put pressure on top of the bung and not push down by the sides of the bung then our hands may slip and get gashed on the conical flask if it were to smash.

I will also make sure that whenever we are using the cork borer I will put a tile on the table so neither our hands or the table will be cut by the borer as it is very sharp.

## **Conclusion.**

My prediction was right, the higher the concentration of hydrogen peroxide then the quicker oxygen is given off. This is because there is more hydrogen peroxide present in the mixture and less water so the chances of a reaction taking place greatly increases. The more hydrogen peroxide in the mixture then the chance of a collision increases, as there are more hydrogen peroxide particles present in the solution that may bump into and react with the potato. With a higher concentration of hydrogen peroxide, the more amylase enzymes there are to break down the starch molecules. They will then be able to move on and break down even more starch molecules giving off oxygen a lot quicker than if there was a smaller concentration.

## **Evaluation.**

With the data I have collected I will be able to draw some good graphs. As I did not get any anomalous results, so with the results I have I will be able to take good graphs. As there are no anomalous results I know that my graph will be accurate. Although I would still like to re do the test to make sure that I did everything correctly.

If I were to improve the experiment I could change a number of things, I would do the experiment again to make sure that I get the same sort of results. I could also take more

Readings for each time I vary the amount of water and hydro peroxide so that the average results would be better, I would like to take five readings instead of three. I would also like to do the experiment with changes in temperature so that I can learn more about the rate of reaction with other different variables. I would also like to do the experiment again using a different potato so that I could note the differences in the amount of catalyse in each potato.