

Hydrogen peroxide essay sample

[Science](#), [Chemistry](#)



In my coursework I will investigate about enzymes in potatoes reacting with Hydrogen Peroxide. In particular I will investigate the effects of changing the surface area of a potato when added to Hydrogen Peroxide. This is because, when increasing the surface area of the potatoes it will increase the rate of reaction because there will be more surface area on which particles from the potato and the Hydrogen Peroxide will collide on, and with more surface area there would be more particles carrying kinetic energy, and by carrying more kinetic energy the chance of the reaction to reach its activation energy is more higher and therefore creates more successful collisions and by making more successful collisions the speed of the reaction is increased.

Prediction: Therefore I predict that the crushed potatoes would produce 4.5cm³ of bubbles under the time of 3 minutes, which will be quicker than the not crushed potatoes because increasing the surface area of the potato would increase the rate of reaction and therefore increase the amount of oxygen being produced in the form of bubbles, which will fill up the test tube in the crushed potatoes more quicker.

In my experiment Hydrogen Peroxide is being used as a reactant with the potato, with an unstable structure the Hydrogen Peroxide will be changed after the reaction with a substance called catalyse which can break it down into oxygen and water which is a more sustainable, as shown:

Hydrogen peroxide Water + oxygen



And with oxygen being produced in the form of bubbles, I can then read off the amount of oxygen being produced during the reaction through the height of the froth.

Enzymes such as catalase are protein molecules, which are found in living cells of potatoes. They are used to speed up specific reactions in the cells by reacting particles gathered on the catalyst surface and

- 1) collide more frequently with each other,
- 2) more of the collisions result in a reaction between particles

because the catalyst can lower the activation energy for the reaction.

Although they are all very specific, as each enzyme just performs one particular reaction, this is used for removing Hydrogen Peroxide from the cells which can be done with the help of Catalase, which can speed up the decomposition of Hydrogen Peroxide into water and oxygen. It is able to speed up the decomposition of Hydrogen Peroxide because of the shape of the Hydrogen Peroxide molecule, which follows a method called lock and key where Hydrogen Peroxide molecule can fit into an active site within the potato, which makes the chemical reaction. This type of reaction where a molecule is broken down into smaller pieces is called an anabolic reaction. This reaction can be therefore speeded up through the rate of reaction.

The rate of a reaction depends on two factors.

- 1) The number of collision per unit time between the reacting species.

2) The fraction of these collisions those are successful in producing a new molecule and can be increased by:

- 1) Raising the Temperature.
- 2) Increasing the Concentration (in solution).
- 3) Increasing the Pressure (in gases).
- 4) Increasing the Surface Area of a solid.
- 5) Use a catalyst.

I will be measuring the rate of reaction in this experiment by measuring the amount of oxygen being produced in the form of bubbles; the froth produced will be measured by a ruler and timed.

To keep my experiment safe I will do the following;

- Wear eye goggles and gloves to prevent the Hydrogen Peroxide from touching me because Hydrogen Peroxide is corrosive and if it happens to touch my hand, I will instantly wash it with water.
- Hold cork borer safely, keeping hands away from the end.
- Tie long hair or anything loose in.
- Hold knife properly and keeping out away from anyone.
- Create a safe environment to work on, where nothing like a water puddle on the floor might not slip me.

To make my experiment a fair test I will keep the same amount of Hydrogen Peroxide in each test tube the same at 10cm³, saw that there is equal amount of Hydrogen peroxide particles reacting with the potato and therefore not effecting the experiment in anyway, where by adding more will increase the rate of reaction because of more particles being available or less amount of Hydrogen Peroxide which may decrease the rate of reaction because of not having enough particles to react with.

I will keep the same size of potato in each test tube so that there is an equal amount of potato particles reacting with the Hydrogen Peroxide and therefore it doesn't affect the reaction in anyway whereas if I used a bigger potato it will increase the rate of reaction because of more potato particles being available or by using a smaller potato might the rate of reaction because of having less same amount of particles.

I will also keep the concentration of the Hydrogen Peroxide the same to 20 Volume so that there is the same concentrated particles within the Hydrogen Peroxide when reacting with the potato, therefore not affecting the reaction process and by choosing the highest Volume of Hydrogen Peroxide I will be putting a reasonable amount of particles reacting with the potato. Whereas increasing the concentration of hydrogen peroxide will increase the rate of reaction or by using a weaker concentration would decrease the time.

Method:

1. In my experiment I will firstly collect the apparatus needed to carry out the experiment which are- test tube, test tube rack, Hydrogen Peroxide (20

Volume), potato, cork borer, stopwatch, ruler, knife, measuring cylinder and set it out shown in the diagram.

2. I will then cut out 6 pieces of potato with a number 5-cork borer safely, which will keep the shape of each potato the same, but I will then finely cut the pieces of potato in equal sizes by using a knife and ruler to shape the length to 3 cm and the width to 1 cm.

3. I will then crush 3 of the potatoes so its surface area is increased, which will be used to compared with the not crushed potato by inserting them into a test tube filled with 15 cm³ of 20 Volume of Hydrogen Peroxide. Although I cannot squash all the potato identically the same, I will try my best to squash all 3 the same equally.

4. I will then time the amount of bubbles produced by using a stopwatch and also measure the height of the froth by using a ruler so that I can make my experiment as accurate as possible.

Results

First Experiment

Potato

Amount of Hydro Peroxide cm³ Gas Produced cm³ Time (mins)

1 10cm³ 4. 5cm³ 2. 4

2 10cm³ 4. 5cm³ 2. 37

3 10cm³ 4. 5cm³ 2. 53

4

10cm³ 4. 5cm³ 3. 3

5 10cm³ 4. 5cm³ 3. 37

6 10cm³ 4. 5cm³ 3. 35

Second Experiment

Potato Amount of Hydro Peroxide cm³ Gas Produced cm³ Time (mins)

1

10cm³ 4. 5cm³ 2. 45

2 10cm³ 4. 5cm³ 2. 31

3 10cm³ 4. 5cm³ 2. 37

4

10cm³ 4. 5cm³ 3. 39

5 10cm³ 4. 5cm³ 3. 4

6 10cm³ 4. 5cm³ 3. 35

In this experiment I have collected the gas by measuring the froth.

By doing my experiment twice I can make a average by using the formula

Analysis

From the graph I can see that my prediction was correct, that increasing the surface area of the potato would increase the amount of oxygen being produced in the form of bubbles, which will fill up the test tube in the crushed potatoes. This is because increasing the surface area of the potatoes will increase the rate of reaction because there will be more surface area on which particles from the potato and the hydrogen peroxide will collide on, and with more surface area there would be more particles carrying kinetic energy, and by carrying more kinetic energy the chance of the reaction to reach its activation energy is more higher and by making successful collisions the rate of reaction will increase.

Looking at the graph, this supports my prediction because it shows a pattern where the crushed potato's times are more lower than those potatoes that wasn't, showing that less time is taken to fill the test tube with bubbles because of the rate of reaction being increase through the surface area.

This also proves the theory of Lock and key and the surface area. Where enzymes in potatoes specifically fit into the active site and also when increasing the surface are makes a more successful collisions through the increased rate of reaction.

Evaluation

From looking at my results I can see that they have proved my prediction and in this experiments I have worked very well without any major problems or obtaining anomalous results and by doing a concise and straight forward

method which had helped me to plan out my experiment in first hand but also it can be used by someone else, who may want to carryout the same experiment to backup my experiment or show any mistakes or improvements which might improve the accuracy or reliability

By doing my experiment twice I have made it more reliable than doing it once where my experiment can be compared to show any differences and also supports my prediction. But my experiment is not very accurate because I am trying to collect bubbles, which is difficult to collect because the bubbles might disappear after a while. Although if I were to do it again I could change certain things like changing the method to collect the oxygen by using the swan neck delivery tube were it would be more accurate to collect the oxygen. I can also use other enzymes because using only one enzyme to say that it increases the rate of reaction does not prove it about all the other enzymes. Other practical could have been done instead of using the same vegetable like carrots, Swede or parsnip or liquids. The concentration used could be different, to 10 Volume or less.

With enzymes, there active site can be changed through increasing the heat of the enzyme which will denature it and so the active site is changed and the correct molecules may not fit into to make the reaction and for another experiment I could do a experiment where I could see that this is true by using 3 potatoes which have been boiled, which will supposedly denature the enzymes and 3 normal potatoes which will be mixed with the Hydrogen Peroxide to see if the react the same and produce the same amount of oxygen.