

CBA1 Extended Experimental Investigation

A. Questioning and Predicting

We chose the topic "Chemical Reactions"
Our research question was "Does increasing
the concentration of the enzyme catalase in
celery speed up the rate of reaction with hydrogen
peroxide?" We used our book for help
as we got the experiment idea from there.
We used the internet to help us improve & change
the experiment ^{able} by finding out the factors
that would affect the reaction. We decided
to use the factor 'enzyme concentration'
and then formed our own research question.
Our hypothesis was that if we increase
the concentration of catalase the reaction
would speed up.

1. Forms a testable
hypothesis

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B. Planning and Conducting

Our first test for this experiment was on the 1st of May. We used 20cm³ of pH 10 Buffer Solution, 3 drops of wash-up liquid, 5cm³ of Hydrogen Peroxide and 3g of celery. The equipment we used were 2 beakers, a graduated cylinder, gloves, goggles, dropper, pestle and mortar. First we put the pH 10 Buffer Solution in the graduate cylinder. Then we put 3 drops of washing-up liquid. We added the ^{cut} celery after and then the hydrogen peroxide. Unfortunately nothing happened. We tried this method another 3 ^{adding more celery} times but every time we broke up the celery into small bits. The reaction still didn't happen & we had to ^{do something} change it. We ~~then~~ realised that if we blend the celery with water the surface area would increase which would then let the reaction to happen.

The next day I brought in blended celery. I put in 65g of celery and 150ml of water in the blender. It ended up looking like a green liquid. For our next experiment that we were going to do using the celery juice we used:

- 20cm³ pH 10 Buffer Solution
- 2 drops of washing up liquid
- 10ml Hydrogen Peroxide
- 20ml blended celery with water

2. Describes the method and equipment used to collect data.

3. An innovative approach to the issues that enhances the work.

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We used the same procedure we used for the experiment that didn't work. We added 20 cm³ of pH 10 Buffer Solution first. Then 2 drops of washing up liquid. We added the 20 ml of celery juice and finally the 10ml of Hydrogen peroxide. This time the reaction happened and we recorded the data we got.

During this experiment we had to use gloves and goggles as Hydrogen Peroxide is corrosive. After the reaction had taken place a foam had been made. This foam was made because we put in washing-up liquid.

This foam that was there was oxygen. Oxygen had been created because the enzyme catalase in the celery sped up the breakdown of hydrogen peroxide into water and oxygen.

All enzymes work best at a particular pH. The pH can be kept constant using buffer solutions. For example pH 10 buffer keeps the pH at 10. We used the pH 10 Buffer because we needed to keep the catalase pH at 10.

Enzymes are biological catalysts. They control biochemical reactions. When the enzyme catalase reacted with the Hydrogen Peroxide the reaction sped up. Every time we added more celery juice we were increasing the concentration which meant the reaction would happen faster and faster each time.

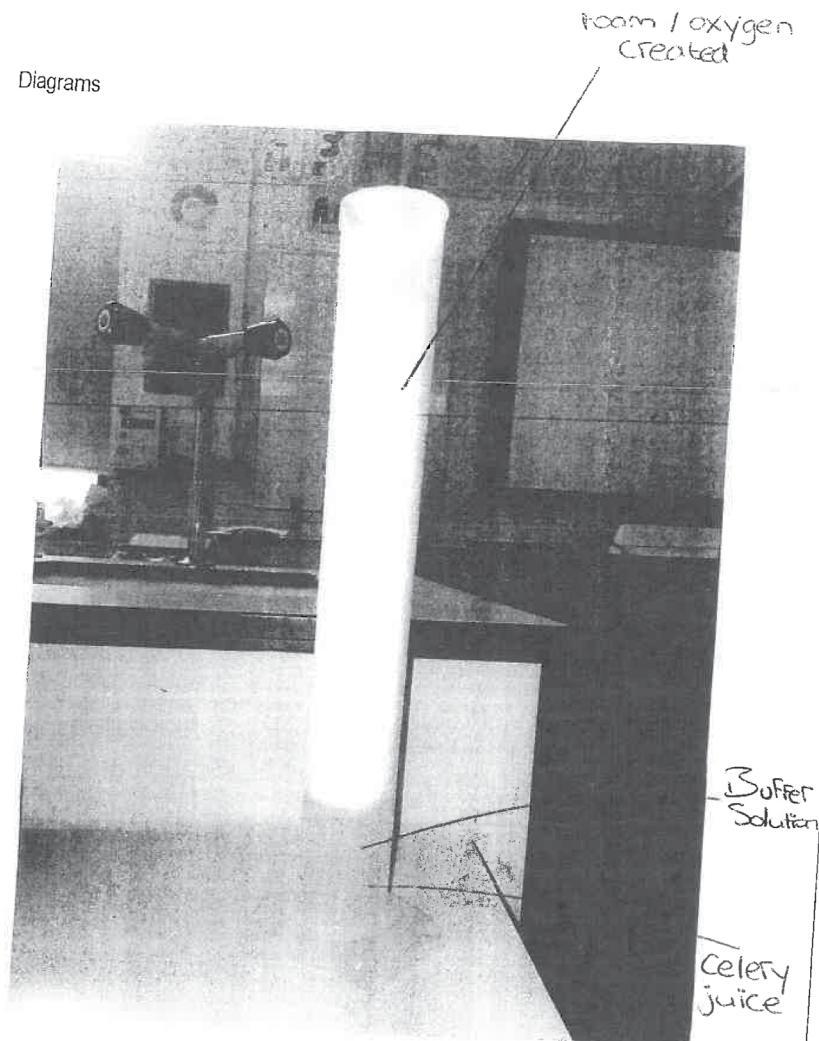
4. Outlines appropriate safety considerations.

5. Uses relevant scientific terminology.

6. Justifies hypothesis.

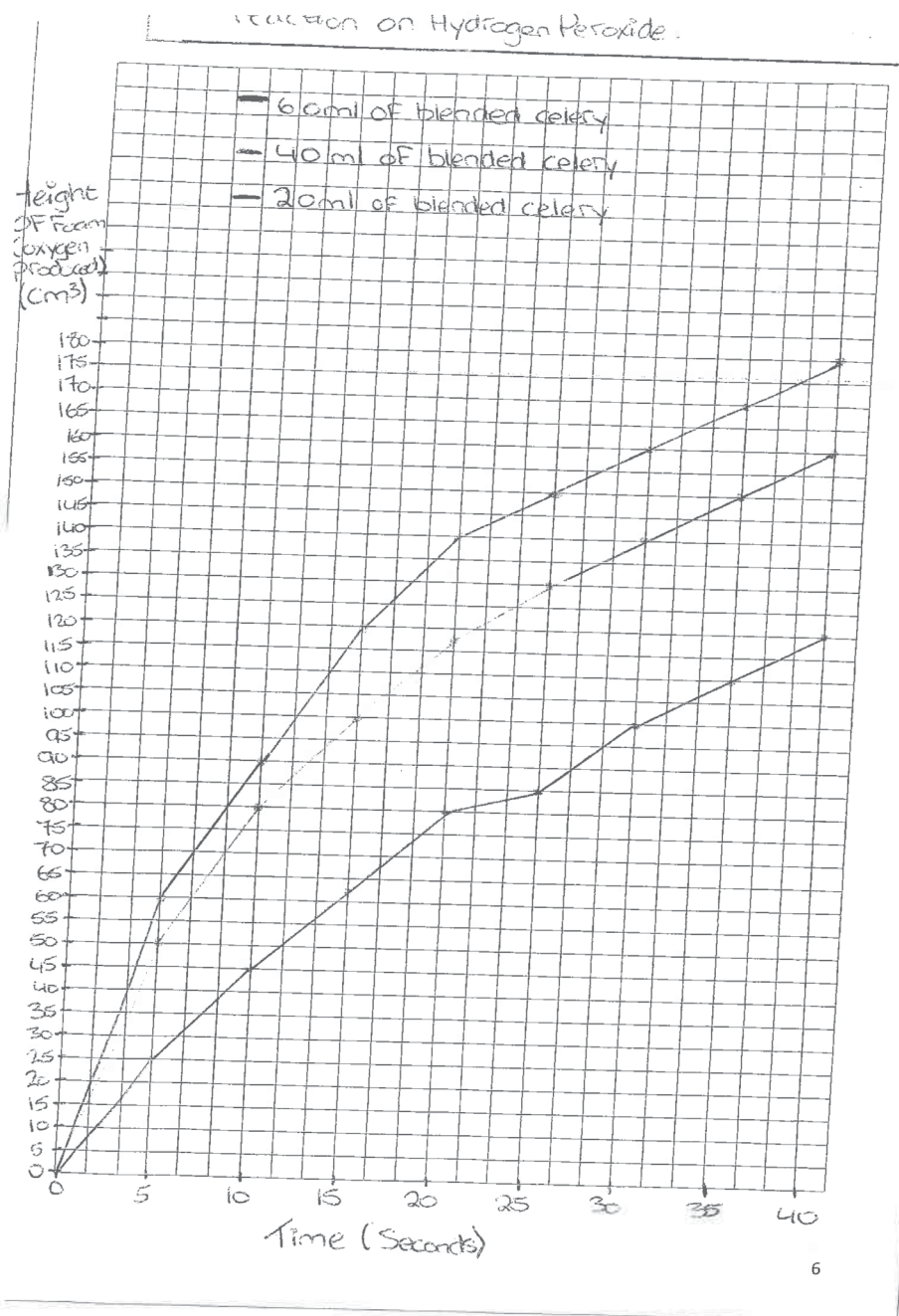
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Diagrams



This is what our final product was when we done the experiment. You can see the celery juice at the bottom which could be reused because it's a catalyst. & the foam at the top which is oxygen.

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8. Displays data using informative representations..

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C. Processing and Analysing

From doing this experiment we found out that increasing the enzyme concentration does speed up the rate of reaction. As we added more celery juice the height of the foam grew faster. The foam that was created was oxygen. This is because hydrogen peroxide is made from water and oxygen. When it reacted with the catalase it was broken down into oxygen and water. The chemical formula for hydrogen peroxide is (H_2O_2) .

We used 20ml, 40ml, 60ml of celery juice because we didn't have too much of it so we decided to split it evenly adding 20ml each time.

By doing this experiment I learned a few things:

- The enzyme concentration does speed up the rate of reaction.
- The enzyme catalase speeds up the rate of reaction on hydrogen peroxide.
- What the Buffer Solution does
- How to carry out an experiment with corrosive chemicals safely.
- The size of the surface area makes a big difference.

9. Describes the relationship between the variables..

10. Uses relevant scientific terminology

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Our controlled variables were:

- Hydrogen Peroxide (10ml)
- Buffer Solution (pH10) (20ml)
- Washing-Up liquid (2 drops)

We used the same amount of hydrogen peroxide, buffer solution and washing-up liquid every time we done the experiment.

Our cause variable was the catalase in the celery juice. This is because the catalase let the reaction happen and speed it up every time we added more.

Our Effect variable was the Foam / oxygen being created. This happened because the catalase reacted with the hydrogen peroxide which released oxygen.
We also used the same equipment each time.

When we done the very first experiment it didn't work because the surface area on the big bits of celery wasn't big enough. This is why we decided to blend it (to increase surface area).

Conclusion:

By carrying out this experiment we found out that our hypothesis has been supported. The reaction sped up when we increased the concentration of the catalase.

11. Describes considerations related to reliability and fairness.

12. Identifies the variable to be measured and the variable to be changed.

13. draws a conclusion consistent with the data and comments on whether the conclusion supports the hypothesis.

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D. Reflecting and Reporting

I thought our experiment ended up a success in the end. The things we could've improved were:

- Adding 10ml of celery juice every time & seeing how big of a difference in the foam size it makes.
- Putting 5ml of hydrogen peroxide in instead of 10ml & seeing if the reaction changes in any way.

The limitations we had were:

- Not enough time to try the different improvements
- We didn't have enough celery juice.

Another investigation I would conduct would be changing the pH and see if there would be a difference & changing the celery to liver and seeing if the reaction works the same.

Overall I enjoyed doing this investigation & learn a few new things even though it didn't go too well at the start.

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References

- <https://paperop.com/paper-on-different-concentration-enzyme-catalase-affects-rate-breaking-substrate-hydrogen-peroxide/>
- Science Book - The Nature of Science

