**Conditions for effective enzyme action**

**This practical will be written as a scientific practical report. Please use the practical investigation guide to help you write a proper practical report. Also include an Introduction using the questions below.**

**Introduction**

(Do some initial research on enzymes by answering these questions in a short paragraph)

* What are enzymes?
* How do they work?
* What factors affect enzymes?
* What do we mean by “optimal temperature”

*The enzymes studied in this activity are examples of intracellular enzymes, that is, they speed up and control metabolism within cells.*

**Safety** – *Hydrogen peroxide should be handled with care and any accidents reported to teacher. Ensure you are wearing protective equipment at all times. Wash out eye with eye wash equipment if any splashing occurs.*

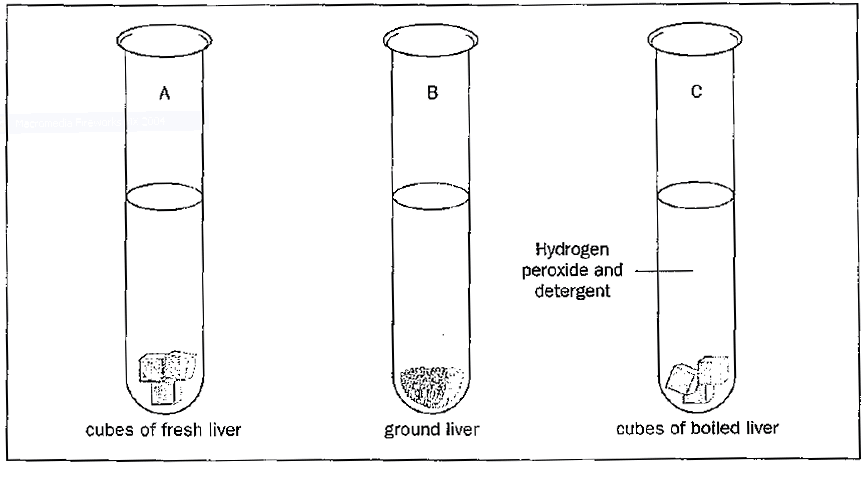
**Purpose**

To investigate the activity of enzymes, and test the effects that temperature has on enzyme function.

**Materials**

* Liver (fresh) finely cut
* 3 test tubes
* 3% Hydrogen peroxide
* Mortar and pestle
* Hot plate/Bunsen burner
* Detergent
* 100 mL beaker

**Figure 1** Measuring catalase activity

Catalase is an enzyme that works very rapidly. It is found in several organs and tissues, including the liver, where its job is to speed up the decomposition of Hydrogen peroxide into oxygen and water:

**2H2O2 2H20 + O2**

Hydrogen peroxide is a by-product of metabolism and is toxic, its rapid conversion to water is therefore important.

1. Collect nine small pieces of liver
2. Place three in a beaker half filled with water and boil strongly for 5 minutes.
3. Place three in a mortar with a little sand and grind with the pestle.
4. Label the test tubes A, B, and C and place 5 mL of hydrogen peroxide and 3 drops of detergent into each.
5. Into tube A place the fresh liver into tube B the ground liver and into tube C the boiled liver.
6. Record the activity of the bubbles (in a table) produced in each test tube and compare.

**Example**

|  |  |  |
| --- | --- | --- |
| **Material** | **Bubble Activity** | **Observations** |
| Cubes of fresh liver | 0 1 2 3 4 5 |  |
|  |  |  |

**Questions**

**(**These questions are to guide you when writing out a **discussion** in your final report. The discussion should be written in paragraphs not in question and answer format)

1. Comment on the relative activity of the three samples. Discuss the differences observed.
2. Why could you estimate the amount of activity of catalase by observing the amount of bubbling in the test tubes?
3. What was the control experiment? What variables were being tested in the other two test tubes?
4. What effect does grinding up the liver have on the enzyme activity? Explain why.
5. Account for the reaction rate seen in test tube C.
6. What reaction is occurring? Write a chemical equation to help explain what is being produced and discuss how you have tested that at least one of the products have been produced. Describe the role catalase has to play in the reaction.
7. Give an evaluation of the practical. What features of the design ensured that it was controlled? Explain any difficulties that occurred and suggest improvements to the experimental method.

**Conclusion**

* Did the results support or disprove your hypothesis. Succinctly explain your main findings.

**Resources (for extra information. You may find more useful resources)**

***How is Hydrogen peroxide made naturally in human cells?***

<http://www.madsci.org/posts/archives/1999-09/938519528.Bc.r.html>

***Enzymes podcast by Paul Anderson***

<http://www.youtube.com/watch?v=ok9esggzN18>