

Biology Practical Report

Investigating the working of a biological catalyst: catalase

- DESIGN

Catalase is a common enzyme found in nearly all living organisms that are exposed to oxygen, where it functions to catalyze the decomposition of hydrogen peroxide to water and oxygen.

Catalase is one of the most potent catalysts known. The reactions it catalyses are crucial to life. Catalase catalyses conversion of Hydrogen Peroxide, a powerful and potentially harmful oxidizing agent, to water and molecular oxygen. Catalase

also uses Hydrogen Peroxide to oxidise toxins including Phenols, Formic Acid, Formaldehyde and Alcohols.

In this practical, the reactions occurring in the substances where catalase (in a form of liver) is added, are observed and recorded.

The testing requires 8 test tubes, which of 1 is filled with 4 ml of distilled water and from 2-8 is filled with 4 ml of fresh H_2O_2 .

Every test tube receives an additive, which is placed there after the H_2O_2 /distilled water;

Tube 1: cube of liver

Tube 2: small amount of manganese dioxide

Tube 3: cube of liver

Tube 4: 1/2 ml of ground liver

Tube 5: cube of boiled liver

Tube 6: cube from acidic condition (pre-prepared in a solution)

Tube 7: cube of liver from alkaline condition (pre-prepared in a solution)

Tube 8: 1/2 ml of ground liver, also temperature of H_2O_2 was measured before and after the addition of liver.

Sidenote: it could be dangerous to test the tube 4 condition for oxygen (with a bung on), since the substance could be in explosive condition.

After the testing of reactions was finished. Droplets of substances were used to test for pH levels.

- THE VARIABLES

Independent: the amount of liver /manganese dioxide inserted to the test tube.

Dependant: Temperature, amount and form of substance in the test tube.

Controlled: The amount of hydrogen peroxide and distilled water in test tubes.

- DATA COLLECTION

Reaction description data:

Tube 1	No visible reaction
Tube 2	Addition of manganedioxide produced bubbling, smoke and gas for 30 seconds. The color of substance turned black which was followed by a temperature raise.
Tube 3	Instant contact with liver cube produced foam which is followed by a raise in temperature. The production of foam continues until it reaches the end of the tube.
Tube 4	Addition of liver produced white foam and bubbling in the substance
Tube 5	No significant reaction, a slight visible breakdown of the particles
Tube 6	No significant reaction
Tube 7	Addition of alkaline liver formed bubbling in the bottom of the tube. Some parts of the liver surface turn white. A layer of foam forms on the surface at increasing rate
Tube 8	Initial temperature: 18°C After addition of liver: 55°C (from the surface), 30°C (bottom temperature)

Results of Ph testing:

Test tube number	Ph level
1	6
2	6
3	6
4	5
5	5
6	1
7	8
8	5

-CONCLUSION AND EVALUATION

Regarding test tube 2;

When the Manganese Dioxide (black powder) was added to the Hydrogen Peroxide (clear), it bubbled. It creates Water and Oxygen gas and the reaction is decomposition.

Hydrogen Peroxide \rightarrow Water + Oxygen

Regarding test tube 3;

Liver contains high amounts of catalase which speeds up the reaction.

Regarding test tube 5;

Catalase is the protein that catalyzes the decomposition of Hydrogen Peroxide to diatomic Hydrogen and Oxygen. Heat denatures or destroys proteins, so a boiled liver sample has denatured catalase proteins which can no longer perform their metabolic function.

References :

- 1.Chelikani P, Fita I, Loewen PC (January 2004). "Diversity of structures and properties among catalases". Cell. Mol. Life Sci.
- 2.<http://www.catalase.com/cataext.htm>