

### Introduction

Cells contain special proteins called **ENZYMES**. Enzymes speed up the **RATE** of the **chemical** reactions going on in living things. There is one specific enzyme for each of these reactions. The enzyme binds to the compound for which it is specific. This compound is called the **SUBSTRATE**.

**CATALASE** is one of over 4,000 enzymes found in the cells of all living things. Catalase will bind to only one substrate, **hydrogen peroxide** ( $H_2O_2$ ). Hydrogen peroxide is a poisonous waste produced in large quantity in liver cells. In this lab, we are using cow liver cells. **CATALASE** binds to  $H_2O_2$  and breaks it into two non-poisonous substances: **WATER** ( $H_2O$ ) and **OXYGEN** gas ( $O_2$ ). The chemical reaction is:



Biozoom Biology-Catalase Enzyme video: <https://www.youtube.com/watch?v=vdkgpaggjNc>

### Vocabulary Check

#### ENZYME

A protein that speeds up the rate of a chemical reaction in living things.

Enzymes are **NEVER** changed or used up.

**CATALASE** One of over 4,000 enzymes found in all living cells. Catalase only binds to hydrogen peroxide breaking it into water and oxygen.

#### SUBSTRATE

The specific reactant to which an enzyme binds.

**HYDROGEN PEROXIDE** A poisonous product found in cells. Substrate for the enzyme Catalase.

**DENATURATION** When the enzyme's active site is destroyed and no longer fits the substrate.

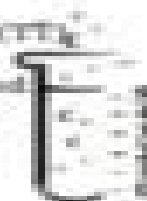
### Materials

1. **SAFETY GLASSES** required **AT ALL TIMES**.
2. Liver (**RAW**) (\***RINSE** if contact)
3. Liver (cooked)
4. Hydrogen Peroxide ( $H_2O_2$ ) (\***RINSE** if contact)
5. Hydrochloric Acid (HCl) (\***RINSE** if contact)
6. Seven numbered test tubes
7. Pipettes (Note: the 1 ml and 2 ml marks)
8. Scissors to cut raw liver into "pear sized" pieces
9. Tool thin, long to push liver down into solution

- LAB OBJECTIVES:**
- \* To demonstrate enzyme activity of catalase on the breakdown of hydrogen peroxide in the living cells of a cow's liver
  - \* To observe conditions that affect enzyme activity

### PROCEDURE:

1. **READ** and **ANSWER** questions in the grey box describing the contents of each Test Tube (TT#)
  2. To each test tube, add the substances stated in the exact **QUANTITY** and **ORDER** listed.
  3. Cut a pear-sized piece of raw liver, except for experiment #3, where cooked liver is provided.
  4. Be sure to use the tool provided (long rod/stick) to push the liver down into the solution.
  5. **IMMEDIATELY OBSERVE & RECORD** the reaction in your test tube
- (On scale of 0 to 5: FIVE is the highest amount of reaction - ZERO is no reaction at all.)



# Enzyme Catalysis Lab Activity Student Study Guide

**Clemens Wendtner**



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