

BIOLOGY LAB: CATALASE

Observing an Enzyme

INTRODUCTION:

What would happen to your cells if they made a poisonous chemical? You might think that they would die. In fact, your cells are always making poisonous chemicals. They do not die because your cells use enzymes to break down these poisonous chemicals into harmless substances. **Enzymes** are proteins that speed up the rate of reactions that would otherwise happen more slowly. The enzyme is not altered by the reaction. You have hundreds of different enzymes in each of your cells. Each of these enzymes is responsible for one particular reaction that occurs in the cell.

In this lab, you will study an enzyme that is found in the cells of many living tissues. The name of the enzyme is catalase (KAT-uh-LAYSS); it speeds up a reaction which breaks down **hydrogen peroxide**, a toxic chemical, into 2 harmless substances--**water and oxygen**. The reaction is as follows:



This reaction is important to cells because hydrogen peroxide (H_2O_2) is produced as a byproduct of many normal cellular reactions. If the cells did not break down the hydrogen peroxide, toxic levels would accumulate and destroy the cell.

In this lab, you will study the catalase found in beef or chicken liver cells. Even though catalase is an enzyme found in many cells, it is found in high levels in liver cells because the liver often functions to break down toxins present in the blood. It might seem strange to use dead cells to study the function of enzymes. This is possible because when a cell dies, the enzymes remain intact and active for several weeks, as long as the tissue is kept refrigerated.

PRELAB REVIEW:

Recall that the substrate is the molecule that the enzyme acts on, the products are the molecules produced by the reaction and enzymes are "reusable."

Under certain conditions enzymes are **denatured**. An enzyme is denatured when the protein molecule loses its proper 3-dimensional shape and can no longer function. Some things that can denature an enzyme are high temperatures, extremes of pH, heavy metals, and alcohol.

MATERIALS:

- *8 Test tubes
- *10-ml Graduated cylinder
- *Fresh liver, chicken meat, and Potato
- *3% Hydrogen peroxide solution
- *Distilled water
- *Stirring rod

- *Test Tube rack
- *Tweezers
- *Waste cup
- *1 Beaker (to hold test tubes)
- *Petri dish

FOR THE CLASS:

- *Thermometers
- *Ice water bath (0°C)
- *water bath #1 (36°C)
- *water bath #2 (80°C)
- *Boiling water bath (100°C)

PROCEDURE:

****You are responsible for cleaning your group's lab supplies, lab table, and sink. Liquids may be poured down the sink, but solids (ex: potato cells, apple cells, paper towels) must be thrown away in the trash!!!****

Part I

Setting up the control.

NOTE: Be sure to clean your stirring rod (and test tubes) between steps.

1. Place 1 dropper full of liquid liver into a clean test tube.
2. Place **2 ml** of the 3% hydrogen peroxide solution into a graduated cylinder.
3. Add the hydrogen peroxide to the test tube and carefully observe the rate of reaction (how rapidly the solution bubbles/ its speed).
4. Throughout this investigation you will estimate the rate of the reaction (how rapidly the solution bubbles) on a scale of 0-5 (0=no reaction/no bubbles, 1=slow, ..., 5= very fast). **Assume that the reaction in step 3 proceeded at a rate of "4."**

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N Noddings



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Laboratory Manual in the Science of Biology Paul B. Weisz,1967 **Biology Laboratory Manual** Darrell S. Vodopich,Randy Moore,1998-12 This laboratory manual is designed for an introductory majors biology course with a broad survey of basic laboratory techniques The experiments and procedures are simple safe easy to perform and especially appropriate for large classes Few experiments require a second class meeting to complete the procedure Each exercise includes many photographs traditional topics and experiments that help students learn about life Procedures within each exercise are numerous and discrete so that an exercise can be tailored to the needs of the students the style of the instructor and the facilities available **Manual for laboratory classes in biological physics** Коллектив авторов,2022-01-29 The methodical development for Laboratory Work in Biophysics is a set of teaching materials and

guidelines for laboratory work in biophysics that has been prepared and held at the Al Farabi Kazakh National University This book is designed for a small biophysical workshop and a special workshop The works presented here do not require complex and expensive equipment and can easily be reproduced in any university laboratory The methodical development describes the main sections of Biophysics thermodynamics of electrical conductivity in biological systems bioelectric phenomena photometric methods of biological system s research lasers in biology and medicine and others Self help questions that were designed to further the understanding of the processes and phenomena observed during laboratory work can be found at the end of each chapter This guide is intended for university students studying in the fields of biology biotechnology ecology and medicine Publishing in authorial release *Laboratory Manual for Cell Biology* William J. Brett,1967 **Laboratory Exercises and Techniques in Cellular Biology** Anthony Contento,2012-10-26 The Contento Experimental Cell Biology Lab Book is a modular design that matches the topics discussed in Karp s textbook The manual itself consists of 30 experiments that coincide and complement each of the 18 chapters in the Karp text There are three possible designs of the lab book based on the instructor s needs These designs focus on either Techniques Concepts or Organelles The procedures of the 30 experiments remain standard and unchanged in all designs of the lab book Special Overview pages Discussion Questions and Datasheets bookend the procedures in order to create each of the possible textbook designs This gives instructors flexibility to create a lab book that suits their lecture course curriculum their experience and available equipment and supplies *Fundamentals of Biology* Rick Gelinas, A Lab Manual to be used with the Biology 102 class at Diablo Valley College **Concepts Biology Lab Manual** Roger Davis,1995-07 **A Laboratory Manual on Rhipicephalus microplus** Raquel Cossio-Bayugar,Estefan Miranda-Miranda,Sachin Kumar,2023-05-03 Discussing all aspects connected with the scientific analysis of Rhipicephalus microplus this book covers tick classification and identification as well as methods of extracting natural products effective against ticks It also describes tick cell culture procedures tick acaricide resistance diagnostics and the identification of tick parasites and microorganisms from the host and the ticks fluids as well as the diagnosis of Babesia and Anaplasma in R microplus Laboratory Methods in Microbiology and Molecular Biology Richa Salwan,Vivek Sharma,2023-06-13 Laboratory Methods in Microbiology and Molecular Biology describes various microbiological biochemical and molecular methods employed for the characterization identification and analysis of actinomycetes bacteria and fungi The book details general guidelines expectations and responsibilities for good lab practices and consists of chapters that covers basic microbiological physiological biochemical and molecular aspects as well as in silico analysis using various bioinformatic tools Other topics in the book include how to make solutions microscopy and imaging of microorganisms sero diagnostics and basic concepts of phylogeny physiology biotechnology soil food and environmental microbiology while working in laboratory Laboratory Methods in Microbiology and Molecular Biology is an informative update to current practices and future perspectives for the field of microbial

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Cell Biology Ray Arters, The cell stands as the fundamental unit of life

representing the smallest structure that exhibits all the characteristics we associate with living organisms Understanding cell biology requires recognizing that every living thing from the simplest bacteria to the most complex multicellular organisms is composed of cells that carry out the essential processes of life including metabolism growth reproduction and response to environmental stimuli This remarkable universality of cellular organization reveals the common evolutionary origin of all life on Earth while highlighting the extraordinary diversity that has emerged from basic cellular mechanisms Cell theory established in the 19th century through the work of scientists including Matthias Schleiden Theodor Schwann and Rudolf Virchow provides the conceptual foundation for understanding life at its most basic level This theory states that all living organisms are composed of one or more cells that the cell is the basic unit of life and that all cells arise from pre existing cells These simple statements revolutionized biology by providing a unifying framework that connects all forms of life through their shared cellular basis while explaining how life perpetuates itself through cellular reproduction The diversity of cellular organization encompasses two fundamental types prokaryotic cells which lack membrane bound organelles and have their genetic material freely dispersed in the cytoplasm and eukaryotic cells which contain membrane bound organelles including a nucleus that houses their genetic material This distinction reflects a major evolutionary transition that occurred approximately 2 billion years ago when the first eukaryotic cells evolved from prokaryotic ancestors Despite these organizational differences both cell types share fundamental processes and molecular mechanisms that demonstrate their common evolutionary heritage

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Table of Contents Lab Manual For Biology Enzyme Catalase Activity

1. Understanding the eBook Lab Manual For Biology Enzyme Catalase Activity
 - The Rise of Digital Reading Lab Manual For Biology Enzyme Catalase Activity
 - Advantages of eBooks Over Traditional Books
2. Identifying Lab Manual For Biology Enzyme Catalase Activity
 - Exploring Different Genres
 - Considering Fiction vs. Non-Fiction
 - Determining Your Reading Goals
3. Choosing the Right eBook Platform
 - Popular eBook Platforms
 - Features to Look for in an Lab Manual For Biology Enzyme Catalase Activity
 - User-Friendly Interface
4. Exploring eBook Recommendations from Lab Manual For Biology Enzyme Catalase Activity
 - Personalized Recommendations
 - Lab Manual For Biology Enzyme Catalase Activity User Reviews and Ratings
 - Lab Manual For Biology Enzyme Catalase Activity and Bestseller Lists
5. Accessing Lab Manual For Biology Enzyme Catalase Activity Free and Paid eBooks
 - Lab Manual For Biology Enzyme Catalase Activity Public Domain eBooks
 - Lab Manual For Biology Enzyme Catalase Activity eBook Subscription Services
 - Lab Manual For Biology Enzyme Catalase Activity Budget-Friendly Options

6. Navigating Lab Manual For Biology Enzyme Catalase Activity eBook Formats
 - ePub, PDF, MOBI, and More
 - Lab Manual For Biology Enzyme Catalase Activity Compatibility with Devices
 - Lab Manual For Biology Enzyme Catalase Activity Enhanced eBook Features
7. Enhancing Your Reading Experience
 - Adjustable Fonts and Text Sizes of Lab Manual For Biology Enzyme Catalase Activity
 - Highlighting and Note-Taking Lab Manual For Biology Enzyme Catalase Activity
 - Interactive Elements Lab Manual For Biology Enzyme Catalase Activity
8. Staying Engaged with Lab Manual For Biology Enzyme Catalase Activity
 - Joining Online Reading Communities
 - Participating in Virtual Book Clubs
 - Following Authors and Publishers Lab Manual For Biology Enzyme Catalase Activity
9. Balancing eBooks and Physical Books Lab Manual For Biology Enzyme Catalase Activity
 - Benefits of a Digital Library
 - Creating a Diverse Reading Collection Lab Manual For Biology Enzyme Catalase Activity
10. Overcoming Reading Challenges
 - Dealing with Digital Eye Strain
 - Minimizing Distractions
 - Managing Screen Time
11. Cultivating a Reading Routine Lab Manual For Biology Enzyme Catalase Activity
 - Setting Reading Goals Lab Manual For Biology Enzyme Catalase Activity
 - Carving Out Dedicated Reading Time
12. Sourcing Reliable Information of Lab Manual For Biology Enzyme Catalase Activity
 - Fact-Checking eBook Content of Lab Manual For Biology Enzyme Catalase Activity
 - Distinguishing Credible Sources
13. Promoting Lifelong Learning
 - Utilizing eBooks for Skill Development
 - Exploring Educational eBooks
14. Embracing eBook Trends
 - Integration of Multimedia Elements

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