

## Enzyme Action: Testing Catalase Activity (O<sub>2</sub>)

Many organisms can decompose hydrogen peroxide (H<sub>2</sub>O<sub>2</sub>) enzymatically. Enzymes are globular proteins, responsible for most of the chemical activities of living organisms. They act as *catalysts*, substances that speed up chemical reactions without being destroyed or altered during the process. Enzymes are extremely efficient and may be used over and over again. One enzyme may catalyze thousands of reactions every second. Both the temperature and the pH at which enzymes function are extremely important. Most organisms have a preferred temperature range in which they survive, and their enzymes most likely function best within that temperature range. If the environment of the enzyme is too acidic or too basic, the enzyme may irreversibly *denature*, or unravel, until it no longer has the shape necessary for proper functioning.

H<sub>2</sub>O<sub>2</sub> is toxic to most living organisms. Many organisms are capable of enzymatically destroying the H<sub>2</sub>O<sub>2</sub> before it can do much damage. H<sub>2</sub>O<sub>2</sub> can be converted to oxygen and water, as follows:



Although this reaction occurs spontaneously, enzymes increase the rate considerably. At least two different enzymes are known to catalyze this reaction: *catalase*, found in animals and protists, and *peroxidase*, found in plants. A great deal can be learned about enzymes by studying the rates of enzyme-catalyzed reactions.

In this experiment, you will measure the rate of enzyme activity under various conditions, such as different enzyme concentrations, pH values, and temperatures. It is possible to measure the concentration of oxygen gas formed as H<sub>2</sub>O<sub>2</sub> is destroyed using an O<sub>2</sub> Gas Sensor. If a plot is made, it may appear similar to the graph shown.

At the start of the reaction, there is no product, and the concentration is the same as the atmosphere. After a short time, oxygen accumulates at a rather constant rate. The slope of the curve at this initial time is constant and is called the *initial rate*. As the peroxide is destroyed, less of it is available to react and the O<sub>2</sub> is produced at lower rates. When no more peroxide is left, O<sub>2</sub> is no longer produced.



Figure 1

### MATERIALS

Power Macintosh or Windows PC  
Vernier computer interface  
LoggerPro  
Vernier O<sub>2</sub> Gas Sensor  
400-mL beaker  
10-mL graduated cylinder  
250-mL Nalgene bottle  
1.5% H<sub>2</sub>O<sub>2</sub>  
3.0% H<sub>2</sub>O<sub>2</sub>

enzyme suspension  
three 18 x 150 mm test tubes  
ice  
pH buffers  
test tube rack  
thermometer  
three dropper pipettes  
Graphical Analysis (optional)

# **Enzyme Action Testing Catalase Activity Lab Answers**

**Athel Cornish-Bowden**



# Enzyme Action Testing Catalase Activity Lab Answers

Agricultural Science with Vernier Robyn L. Johnson,2010-07 *Biocatalysis and Agricultural Biotechnology* Ching T. Hou,Jeï-Fu Shaw,2009-04-27 Worldwide energy and food crises are spotlighting the importance of bio based products an area many are calling on for solutions to these shortages Biocatalysis and Agricultural Biotechnology encapsulates the cutting edge advances in the field with contributions from more than 50 international experts comprising sectors of academia industry an **Biology for AP @ Courses** Julianne Zedalis,John Eggebrecht,2017-10-16 Biology for AP courses covers the scope and sequence requirements of a typical two semester Advanced Placement biology course The text provides comprehensive coverage of foundational research and core biology concepts through an evolutionary lens Biology for AP Courses was designed to meet and exceed the requirements of the College Board s AP Biology framework while allowing significant flexibility for instructors Each section of the book includes an introduction based on the AP curriculum and includes rich features that engage students in scientific practice and AP test preparation it also highlights careers and research opportunities in biological sciences *Oxidative Damage to Plants* Parvaiz Ahmad,2014-01-29 With contributions that review research on this topic throughout the world Oxidative Damage to Plants covers key areas of discovery from the generation of reactive oxygen species ROSs their mechanisms quenching of these ROSs through enzymatic and non enzymatic antioxidants and detailed aspects of such antioxidants as SOD and CAT Environmental stress is responsible for the generation of oxidative stress which causes oxidative damage to biomolecules and hence reduces crop yield To cope up with these problems scientists have to fully understand the generation of reactive oxygen species its impact on plants and how plants will be able to withstand these stresses Provides invaluable information about the role of antioxidants in alleviating oxidative stress Examines both the negative effects senescence impaired photosynthesis and necrosis and positive effects crucial role that superoxide plays against invading microbes of ROS on plants Features contributors from a variety of regions globally **Microbiology Laboratory Guidebook** United States. Food Safety and Inspection Service. Microbiology Division,1998 **Nanozymes: Next Wave of Artificial Enzymes** Xiaoyu Wang,Wenjing Guo,Yihui Hu,Jiangjiexing Wu,Hui Wei,2016-07-27 This book describes the fundamental concepts the latest developments and the outlook of the field of nanozymes i e the catalytic nanomaterials with enzymatic characteristics As one of today s most exciting fields nanozyme research lies at the interface of chemistry biology materials science and nanotechnology Each of the book s six chapters explores advances in nanozymes Following an introduction to the rise of nanozymes research in the course of research on natural enzymes and artificial enzymes in Chapter 1 Chapters 2 through 5 discuss different nanomaterials used to mimic various natural enzymes from carbon based and metal based nanomaterials to metal oxide based nanomaterials and other nanomaterials In each of these chapters the nanomaterials enzyme mimetic activities catalytic mechanisms and key

applications are covered In closing Chapter 6 addresses the current challenges and outlines further directions for nanozymes Presenting extensive information on nanozymes and supplemented with a wealth of color illustrations and tables the book offers an ideal guide for readers from disparate areas including analytical chemistry materials science nanoscience and nanotechnology biomedical and clinical engineering environmental science and engineering green chemistry and novel catalysis

**Principles of Modern Microbiology** Mark Wheelis,2008 This text balances brevity and clarity in a condensed introduction to microbiology It contains a manageable amount of detail and yet covers the full range and diversity of the microbial world

**Biochemical Ecotoxicology** Francois Gagne,2014-07-07 Biochemical Ecotoxicology Principles and Methods presents practical approaches to biochemical ecotoxicology experiments for environmental protection and conservation With its methodical stepped approach this essential reference introduces readers to current techniques for toxicity endpoint testing suitable for laboratories of any size and budget Each chapter presents a state of the art principle a quick and inexpensive procedure including appropriate reagents case studies and demonstrations on how to analyze your results Generic techniques are covered suitable for a variety of organisms as well as high throughput techniques like quantitative polymerase chain reactions and enzyme linked immunoassays Cutting edge approaches including gPCR arrays and lipidomic techniques are also included making this is an essential reference for anyone who needs to assess environmental toxicity Practical cost effective approaches to assess environmental toxicity endpoints for all types of organism Presents theory methods case studies and information on how to analyze results State of the art techniques such as omics approaches to toxicology

Enzymology of Disturbed Soils S. Kiss,D. Pasca,M. Dragan-Bularda,1998-10-21 The disturbance of soils like other phenomena of environmental pollution encountered in so many areas all over the world has become a subject of extensive concern and has led to a vast amount of literature in the field of enzymology too The book is the first comprehensive and updated review of the enzymological literature on three great categories of disturbed soils including their remediation The volume consists of three sections I Enzymology of oil contaminated soils II Enzymology of soils affected by industrial emissions and III enzymology of technogenic soils Within each section the reviewed studies are grouped by country The volume will be of great value to soil scientists environmental scientists conservationists and many other scientists in these and related fields

**Cumulated Index Medicus** ,1977 **Toxicological Profile for Lead** ,2007 *Biology with Vernier* Kelly Redding,David Masterman,2007-01-01 *Molecular Biology of the Cell* ,2002 **Nutrient Requirements of Laboratory Animals**, National Research Council,Board on Agriculture,Committee on Animal Nutrition,Subcommittee on Laboratory Animal Nutrition,1995-02-01 In the years since the third edition of this indispensable reference was published a great deal has been learned about the nutritional requirements of common laboratory species rat mouse guinea pig hamster gerbil and vole The Fourth Revised Edition presents the current expert understanding of the lipid carbohydrate protein mineral vitamin and other nutritional needs of these animals The extensive use of tables provides easy access to a wealth of

comprehensive data and resource information The volume also provides an expanded background discussion of general dietary considerations In addition to a more user friendly organization new features in this edition include A significantly expanded section on dietary requirements for rats reporting substantial new findings A new section on nutrients that are not required but that may produce beneficial results New information on growth and reproductive performance among the most commonly used strains of rats and mice and on several hamster species An expanded discussion of diet formulation and preparation including sample diets of both purified and natural ingredients New information on mineral deficiency and toxicity including warning signs This authoritative resource will be important to researchers laboratory technicians and manufacturers of laboratory animal feed

**Fundamentals of Enzyme Kinetics** Athel Cornish-Bowden,2014-05-20

Fundamentals of Enzyme Kinetics details the rate of reactions catalyzed by different enzymes and the effects of varying the conditions on them The book includes the basic principles of chemical kinetics especially the order of a reaction and its rate constraints The text also gives an introduction to enzyme kinetics the idea of an enzyme substrate complex the Michaelis Menten equation the steady state treatment and the validity of its assumption Practical considerations the derivation of steady state rate equations inhibitors and activators and two substrate reactions are also explained Problems after the end of each chapter have also been added as well as their solutions at the end of the book to test the readers learning The text is highly recommended for undergraduate students in biochemistry who wish to study about enzymes or focus completely on enzymology as most of the mathematics used in this book which have been explained in detail to remove most barriers of understanding is elementary

*ENZYMES: Catalysis, Kinetics and Mechanisms* N.S. Punekar,2018-11-11

This enzymology textbook for graduate and advanced undergraduate students covers the syllabi of most universities where this subject is regularly taught It focuses on the synchrony between the two broad mechanistic facets of enzymology the chemical and the kinetic and also highlights the synergy between enzyme structure and mechanism Designed for self study it explains how to plan enzyme experiments and subsequently analyze the data collected The book is divided into five major sections 1 Introduction to enzymes 2 Practical aspects 3 Kinetic Mechanisms 4 Chemical Mechanisms and 5 Enzymology Frontiers Individual concepts are treated as stand alone chapters readers can explore any single concept with minimal cross referencing to the rest of the book Further complex approaches requiring specialized techniques and involved experimentation beyond the reach of an average laboratory are covered in theory with suitable references to guide readers The book provides students researchers and academics in the broad area of biology with a sound theoretical and practical knowledge of enzymes It also caters to those who do not have a practicing enzymologist to teach them the subject

**Laboratory Methods in Anaerobic Bacteriology** V. R. Dowell,Center for Disease Control,1974 **Understanding**

**Chemistry** C N R Rao,2009-07-16 This is the international edition of Prof Rao s popular science book an elementary introduction intended for high school students and others interested in appreciation of chemistry Ideas and facts are

presented and a few questions raised in order to interest the reader in the subject and to arouse curiosity The book covers essential aspects of chemistry features of the modern periodic table bonding between atoms in molecules and substances shapes and structures of molecules metals and materials alkalis and acids carbon compounds electronic structure of atoms classification of elements simple chemical reactions biopolymers and man made polymers and aspects of energy There are also life sketches of chemists and procedures for a few experiments **Principles of Enzyme Kinetics** Athel

Cornish-Bowden,2014-05-20 Principles of Enzyme Kinetics discusses the principles of enzyme kinetics at an intermediate level It is primarily written for first year research students in enzyme kinetics The book is composed of 10 chapters Chapter 1 provides the basic principles of enzyme kinetics with a brief discussion of dimensional analysis Subsequent chapters cover topics on the essential characteristics of steady state kinetics temperature dependence methods for deriving steady state rate equations and control of enzyme activity Integrated rate equations and introductions to the study of fast reactions and the statistical aspects of enzyme kinetics are provided as well Chemists and biochemists will find the book invaluable

*Methods of Enzymatic Analysis, Methods of Enzymatic Analysis* Hans-Ulrich Bergmeyer,1983-11-07

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