



Hydrogen Peroxide Analysis Consumer Chemistry

Introduction

Hydrogen peroxide is regarded as an "environmentally friendly" alternative to chlorine for water purification and wastewater treatment. Because hydrogen peroxide decomposes in the presence of heat, light, or other catalysts, the quality of a hydrogen peroxide solution must be checked regularly to ensure its effectiveness. The concentration of hydrogen peroxide can be analyzed by redox titration with potassium permanganate.

Concepts

- Redox reaction
- Oxidizing and reducing agents
- Titration
- Half-reactions

Background

Titration is a method of volumetric analysis—the use of volume measurements to analyze the concentration of an unknown. The most common types of titrations are acid–base titrations, in which a solution of an acid, for example, is analyzed by measuring the amount of a standard base solution required to neutralize a known amount of the acid. A similar principle applies to redox titrations. If a solution contains a substance that can be oxidized, then the concentration of that substance can be analyzed by titrating it with a standard solution of a strong oxidizing agent.

The equation for an oxidation–reduction reaction can be balanced by assuming that it occurs via two separate half-reactions. In this experiment, potassium permanganate will be used as the titrant to analyze the concentration of hydrogen peroxide in a commercial antiseptic solution. The permanganate ion acts as an oxidizing agent—it causes the oxidation of hydrogen peroxide. The oxidation half-reaction shows that two electrons are lost per molecule of hydrogen peroxide that is oxidized to oxygen gas (Equation 1). The permanganate ion, in turn, is reduced from the +7 oxidation state in MnO_4^- to the +2 oxidation state in Mn^{2+} . The reduction half-reaction shows a gain of five electrons (Equation 2).



Experiment Overview

The purpose of this experiment is to analyze the percent hydrogen peroxide in a common "drugstore" solution by titrating it with potassium permanganate. Standard potassium permanganate solution will be added via buret to the hydrogen peroxide solution. As the dark purple solution is added, it will react with the hydrogen peroxide and the color will clear. When all of the hydrogen peroxide has been used up, the endpoint of the titration occurs when the last drop of potassium permanganate that is added causes the solution to stay pink.

Pre-Lab Questions (Answer questions on a separate sheet of paper.)

1. Combine the oxidation and reduction half-reactions for hydrogen peroxide and permanganate ion, respectively, and write the balanced chemical equation for the overall reaction between H_2O_2 and MnO_4^- in acid solution. *Hint:* The number of electrons transferred must "cancel out."
2. What is the mole ratio of hydrogen peroxide to permanganate ion in the balanced chemical equation determined in Question #1? How many moles of hydrogen peroxide will be oxidized by 0.0045 moles of potassium permanganate in acidic solution?

Analysis Of Hydrogen Peroxide Prelab Answers

Lingjun Ying



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Instructors Manual to Lab Manual Ralph Petrucci, William Harwood, Geoffrey Herring, 2001 **Methods in Biotechnology** Seung-Beom Hong, M. Bazlur Rashid, Lory Z. Santiago-Vázquez, 2016-05-12 As rapid advances in biotechnology occur there is a need for a pedagogical tool to aid current students and laboratory professionals in biotechnological methods *Methods in Biotechnology* is an invaluable resource for those students and professionals *Methods in Biotechnology* engages the reader by implementing an active learning approach provided advanced study questions as well as pre and post lab questions for each lab protocol These self directed study sections encourage the reader to not just perform experiments but to engage with the material on a higher level utilizing critical thinking and troubleshooting skills This text is broken into three sections based on level *Methods in Biotechnology* *Advanced Methods in Biotechnology I* and *Advanced Methods in Biotechnology II* Each section contains 14 22 lab exercises with instructor notes in appendices as well as an answer guide as a part of the book companion site This text will be an excellent resource for both students and laboratory professionals in the biotechnology field **Laboratory Manual for Principles of General Chemistry** J. A. Beran, Mark Lassiter, 2022-08-16 *Laboratory Manual for Principles of General Chemistry* 11th Edition covers two semesters of a general chemistry laboratory program The material focuses on the lab experiences that reinforce the concepts that not all experimental conclusions are the same and depend on identifying an appropriate experimental procedure selecting the proper apparatus employing the proper techniques systematically analyzing and interpreting the data and minimizing inherent variables As a result of good data a scientific and analytical conclusion is made which may or may not be right but is certainly consistent with the data Experiments write textbooks textbooks don't write experiments A student's scientific literacy grows when experiences and observations associated with the scientific method are encountered Further experimentation provides additional cause effect observations leading to an even better understanding of the experiment The 11th edition's experiments are informative and challenging while offering a solid foundation for technique safety and experimental procedure The reporting and analysis of the data and the pre and post lab questions focus on the intuitiveness of the experiment The experiments may accompany any general chemistry textbook and are compiled at the beginning of each curricular unit An Additional Notes column is included in each experiment's Report Sheet to provide a space for recording observations and data during the experiment Continued emphasis on handling data is supported by the Data Analysis section **Experimental Organic Chemistry** John C. Gilbert, Stephen F. Martin, 2006 This proven and well tested laboratory manual for organic chemistry students contains procedures for both miniscale also known as small scale and microscale users This lab manual gives students all the necessary background to enter the laboratory with the knowledge to perform the experiments with confidence For the microscale labs experiments were chosen to provide tangible quantities of material which can then be analyzed Chapters 1 2 introduce students to the equipment record keeping and safety of the

laboratory Chapters 3 6 and 8 are designed to introduce students to laboratory techniques needed to perform all experiments In Chapters 7 and 9 through 20 students are required to use the techniques to synthesize compounds and analyze their properties In Chapter 21 students are introduced to multi step syntheses of organic compounds a practice well known in chemical industry In Chapter 23 students are asked to solve structures of unknown compounds The new chapter 24 introduces a meaningful experiment into the textbook that reflects the increasing emphasis on bioorganic chemistry in the sophomore level organic lecture course This experiment not only gives students the opportunity to accomplish a mechanistically interesting and synthetically important coupling of two amino acids to produce a dipeptide but also provides valuable experience regarding the role of protecting groups in effecting synthetic transformations with multiple functionalized molecules

Chemistry Frank Jenkins,1992 **Exploring General Chemistry in the Laboratory** Colleen F. Craig,Kim N. Gunnerson,2017-02-01 This laboratory manual is intended for a two semester general chemistry course The procedures are written with the goal of simplifying a complicated and often challenging subject for students by applying concepts to everyday life This lab manual covers topics such as composition of compounds reactivity stoichiometry limiting reactants gas laws calorimetry periodic trends molecular structure spectroscopy kinetics equilibria thermodynamics electrochemistry intermolecular forces solutions and coordination complexes By the end of this course you should have a solid understanding of the basic concepts of chemistry which will give you confidence as you embark on your career in science

Biology ,1998 **Laboratory Experiments for General Chemistry** Harold R. Hunt,Toby F. Block,1994

Science Insights ,1999 **Addison-Wesley Science Insights** ,1996 Introductory Chemistry Steven S. Zumdahl,1996 **Microscale and Miniscale Organic Chemistry Laboratory Experiments** Allen M. Schoffstall,Barbara A. Gaddis,Melvin L. Druelinger,2000 This work offers a comprehensive introductory treatment of the organic laboratory techniques for handling glassware and equipment safety in the laboratory micro and mini scale experimental procedures theory of reactions and techniques applications and spectroscopy

Chemistry in the Laboratory James M. Postma,Julian L. Roberts,J. Leland Hollenberg,2009-08-07 For nearly 40 years Chemistry in the Laboratory has been meeting the needs of teachers and students This new edition builds on that legacy while addressing cutting edge trends in the chemistry laboratory including forensic chemistry and environmental and green chemistry As always the new edition of Chemistry in the Laboratory offers precise easy to follow instructions helpful illustrations and an emphasis throughout on laboratory safety Again throughout a Consider This feature encourages users to expand the principles of the experiment into interesting applications open ended experiments or unexplored corners Most experiments in the manual can be completed in one lab session but some can be linked or extended for a multi lab project

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Deckey,1987-01-01 The Analysis of Aqueous Solutions of Hydrogen Peroxide Charles E. Huckaba,1947 A Volumetric Method for Titrimetric Analysis of Hydrogen Peroxide Walter G. Cox,NAVAL SURFACE WEAPONS CENTER SILVER SPRING MD.,1985 This report documents an oxidation reduction scheme for the volumetric analysis of hydrogen peroxide in the approximate range of 30 percent but it is not limited to this range The purpose of the proposed method is to provide a titrimetric noninstrumental method for the analysis of hydrogen peroxide Keywords Hydrogen Peroxide Potassium Dichromate Ferrous Ammonium Sulfate Hexahydrate Titrimetric Analysis Quantitative Analysis Volumetric Analysis With proper care application of the method described in this technical report provides excellent precision *Analysis of Hydrogen Peroxide in Los Angeles Atmosphere* Isaac R. Kaplan,H. Sakugawa,California. Air Resources Board,1987

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