



## DETERMINATION OF $K_a$ FOR A WEAK ACID

### INTRODUCTION

In a previous lab this semester you performed a classic acid–base titration to determine the concentration of a standardized basic solution. This week we will use the principles of a titration to **determine the equilibrium constant ( $K_a$ ) of a weak acid**. Remember that weak acids dissociate in water as follows:



And the equilibrium constant expression is then:

$$\text{Eq. 2} \quad K_a = [\text{H}_3\text{O}^+][\text{A}^{\text{--}}] / [\text{HA}]$$

Since the  $-\log[\text{H}^+] = \text{pH}$  and the  $-\log K_a = \text{p}K_a$ , we can rearrange the equation to what is known as the **Henderson–Hasselbalch**, Eq. 4.

$$\text{Eq. 3} \quad -\log[\text{H}^+] = -\log K_a - \log([\text{HA}] / [\text{A}^{\text{--}}])$$

$$\text{Eq. 4} \quad \text{pH} = \text{p}K_a + \log[\text{A}^{\text{--}}] / [\text{HA}]$$

If we **titrate a weak acid with a strong base**, there will be a point at which the **number of mols of the acid and mols of the conjugate base will be equal**. This occurs when half of the initial acid has been consumed and has generated the **conjugate base** (known as a buffer). At this point the **[HA] equals [A<sup>–</sup>]**, and thus, the ratio becomes one. Since the log of one is zero, the Henderson–Hasselbalch equation **simplifies to  $\text{pH} = \text{p}K_a$** .

$$\text{Eq. 5} \quad \log[\text{A}^{\text{--}}] / [\text{HA}] = 1 \rightarrow \text{pH} = \text{p}K_a + \log(1) \rightarrow \text{pH} = \text{p}K_a$$

# Chem 162 Lab Manual Answers

**Peter Alexander, Richard Joseph  
Block, Harold Palmer Lundgren**



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**Methods of Protein Chemistry, Including Polypeptides: Determination of the size and shape of protein molecules**

Peter Alexander, Richard Joseph Block, Harold Palmer Lundgren, 1960 In the last fifteen years there has been a revolution in the techniques available for the analysis and isolation of proteins Every time a new technique has been introduced numerous papers have appeared describing modifications to it and the research worker who wishes to employ these methods is faced with a very serious problem in deciding which particular variant to use These volumes are intended to provide the fullest practical detail so that any scientist can follow the procedure by using this book alone and without having recourse to the original literature The techniques which are described in full are ones in which all the authors have had first hand experience and the descriptions contain those small but important points which save so much time In the first volume separation and isolation procedures are discussed the second concerns its analysis and reactivity and the third volume with the measurement of the macromolecular properties of proteins     Nielsen's Food Analysis Laboratory Manual B. Pam Ismail, S.

Suzanne Nielsen, 2024-06-20 This fourth edition laboratory manual was written to accompany Nielsen s Food Analysis Sixth Edition by the same authors New to this fourth edition of the laboratory manual are three new chapters that complement both the textbook chapters and the laboratory exercises The book again contains four introductory chapters that help prepare students for doing food analysis laboratory exercises The 26 laboratory exercises in the manual cover 24 of the 35 chapters in the textbook Many of the laboratory exercises have multiple sections to cover several methods of analysis for a particular food component or characteristic Most of the laboratory exercises include the following background reading assignment objective principle of method chemicals reagents precautions and waste disposal supplies equipment procedure data and calculations questions and references This laboratory manual is ideal for the laboratory portion of undergraduate courses in food analysis     **Determination of the Size and Shape of Protein Molecules** P. Alexander, R. J.

Block, 2014-05-12 Analytical Methods of Protein Chemistry Volume 3 Determination of the Size and Shape of Protein Molecules provides information pertinent to the analysis and isolation of protein This book deals with the measurement of the macromolecular properties of proteins Organized into seven chapters this volume begins with an overview of the theory and practice of the electron microscope to allow an understanding of the type of object that may be examined This text then describes the methods of making protein molecules conform to such an ideal which are the techniques of specimen preparation Other chapters consider the determinations of osmotic pressures of proteins This book discusses as well the experimental basis for the theory of the diffusion process in liquids The final chapter deals with the technical problem characteristics of light scattering This book is a valuable resource for electron microscopists protein chemists biologists

physicist physico chemists scientists and research workers      *A Laboratory Manual of Analytical Methods of Protein Chemistry* ,1961      **Laboratory Manual for Biotechnology and Laboratory Science** Lisa A. Seidman,Mary Ellen Kraus,Diana Lietzke Brandner,Jeanette Mowery,2022-12-23 Provides the basic laboratory skills and knowledge to pursue a career in biotechnology Written by four biotechnology instructors with over 20 years of teaching experience it incorporates instruction exercises and laboratory activities that the authors have been using and perfecting for years These exercises and activities help students understand the fundamentals of working in a biotechnology laboratory Building skills through an organized and systematic presentation of materials procedures and tasks the manual explores overarching themes that relate to all biotechnology workplaces including forensic clinical quality control environmental and other testing laboratories Features Provides clear instructions and step by step exercises to make learning the material easier for students There are Lab Notes for Instructors in the Support Material see tab below Emphasizes fundamental laboratory skills that prepare students for the industry Builds students skills through an organized and systematic presentation of materials procedures and tasks Updates reflect recent innovations and regulatory requirements to ensure students stay up to date Supplies skills suitable for careers in forensic clinical quality control environmental and other testing laboratories      **Lab Manual for General, Organic, and Biochemistry** Denise Guinn,Rebecca Brewer,2009-08-21 Teaching all of the necessary concepts within the constraints of a one term chemistry course can be challenging Authors Denise Guinn and Rebecca Brewer have drawn on their 14 years of experience with the one term course to write a textbook that incorporates biochemistry and organic chemistry throughout each chapter emphasizes cases related to allied health and provides students with the practical quantitative skills they will need in their professional lives Essentials of General Organic and Biochemistry captures student interest from day one with a focus on attention getting applications relevant to health care professionals and as much pertinent chemistry as is reasonably possible in a one term course Students value their experience with chemistry getting a true sense of just how relevant it is to their chosen profession To browse a sample chapter view sample ChemCasts and more visit [www.whfreeman.com/gob](http://www.whfreeman.com/gob)      *SAM-TR.* ,1966      *U.S. Government Research Reports* ,1956      *A MANUAL OF PHARMACOLOGY AND ITS APPLICATIONS TO THERAPEUTICS AND TOXICOLOGY* TORALD SOLLMANN, M. D. ,1922      *A Manual of Pharmacology and Its Applications to Therapeuties and Toxicology* Torald Hermann Sollmann,1922      **A Manual of pharmacology and its applications to therapeutics and toxicology** Torald Hermann Sollmann,1922      **Effects of Disease on Clinical Laboratory Tests** Richard B. Friedman,Donald S. Young,1989 An aid to determine the possible cause of laboratory test abnormalities encountered in clinical practice Sections include laboratory test index disease keyword index laboratory test listings disease listings by ICD 9CM classification and references      **Molecular Biology** Dr. Priyanka Siwach,Dr. Namita Singh,2007      **Automation Solutions for Analytical Measurements** Heidi Fleischer,Kerstin Thurow,2017-12-04 The first book dedicated specifically to automated sample preparation and analytical measurements this

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