



# Resolving a Two-Component Mixture

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## Purpose of the Experiment

Separate and recover the components of a mixture of sand and sodium chloride of unknown proportions. Calculate the percent of each component in the mixture and the percent recovery of the components.

## Background Required

You should be familiar with basic techniques for measuring volume and mass. You should understand the concepts associated with solution chemistry and stoichiometry.

## Background Information

A **binary mixture** is a mixture containing only two components. We can use a variety of methods, either physical or chemical, to separate the components of such a mixture. **Physical separation methods** are based on differences between the physical properties of the components, such as solubility or boiling point.

One physical method for separating a liquid from a solid is **decantation**. First, we allow the solid to settle to the bottom of the container. Then we carefully pour off all of the liquid, called the **supernatant liquid**, or **supernate**, into another container, without disturbing the solid.

We can also physically separate a solid from a liquid by **filtration**, a method that involves pouring the mixture onto a porous material, such as filter paper. The solid, called the **residue**, is unable to pass through the pores in the filter paper, so it is retained on the paper. The liquid, which passes through the paper, is called the **filtrate**.

**Evaporation** is a third physical separation method, in which a solution is heated to vaporize and thus remove the solvent. The solid remaining after we have evaporated the solvent was the solute.

When one component of a binary mixture of two solids is soluble in a particular solvent, and the other component is not, we can separate the components using a fourth physical method, **extraction**. We add the solvent, dissolving the soluble component, then separate the mixture using filtration.

### Example Problem

Determine the percent recovery of silver bromide ( $\text{AgBr}$ ) and potassium bromide ( $\text{KBr}$ ) when separated from a sample of a binary mixture weighing 2.18 g, according to the following procedure.

# Resolving A Two Component Mixture

**Christophe Henri Werner Hirs, Serge N.  
Timasheff**



## **Resolving A Two Component Mixture:**

**Resolving a Two Component Mixture** M.L. Gillette, H. Anthony Niedig, J. Iskowitz, Royce M., 1999-01-01 *Resolving Spectral Mixtures*, 2016-08-13 Resolving Spectral Mixtures With Applications from Ultrafast Time Resolved Spectroscopy to Superresolution Imaging offers a comprehensive look into the most important models and frameworks essential to resolving the spectral unmixing problem from multivariate curve resolution and multi way analysis to Bayesian positive source separation and nonlinear unmixing Unravelling total spectral data into the contributions from individual unknown components with limited prior information is a complex problem that has attracted continuous interest for almost four decades Spectral unmixing is a topic of interest in statistics chemometrics signal processing and image analysis For decades researchers from these fields were often unaware of the work in other disciplines due to their different scientific and technical backgrounds and interest in different objects or samples This led to the development of quite different approaches to solving the same problem This multi authored book will bridge the gap between disciplines with contributions from a number of well known and strongly active chemometric and signal processing research groups Among chemists multivariate curve resolution methods are preferred to extract information about the nature amount and location in time process and space imaging and microscopy of chemical constituents in complex samples In signal processing assumptions are usually around statistical independence of the extracted components However the chapters include the complexity of the spectral data to be unmixed as well as dimensionality and size of the data sets Advanced spectroscopy is the key thread linking the different chapters Applications cover a large part of the electromagnetic spectrum Time resolution ranges from femtosecond to second in process spectroscopy and spatial resolution covers the submicronic to macroscopic scale in hyperspectral imaging Demonstrates how and why data analysis signal processing and chemometrics are essential to the spectral unmixing problem Guides the reader through the fundamentals and details of the different methods Presents extensive plots graphical representations and illustrations to help readers understand the features of different techniques and to interpret results Bridges the gap between disciplines with contributions from a number of well known and highly active chemometric and signal processing research groups

**Principles of Fluorescence Spectroscopy** Joseph R. Lakowicz, 2013-04-17 In the second edition of Principles I have attempted to maintain the emphasis on basics while updating the examples to include more recent results from the literature There is a new chapter providing an overview of extrinsic fluorophores The discussion of timeresolved measurements has been expanded to two chapters Quenching has also been expanded in two chapters Energy transfer and anisotropy have each been expanded to three chapters There is also a new chapter on fluorescence sensing To enhance the usefulness of this book as a textbook most chapters are followed by a set of problems Sections which describe advanced topics are indicated as such to allow these sections to be skipped in an introduction course Glossaries are provided for commonly used acronyms and mathematical symbols For those wanting additional information the

final appendix contains a list of recommended books which expand on various specialized topics from the author's Preface

**Mathematical Methods in Engineering** K. Tas, J.A. Tenreiro Machado, D. Baleanu, 2007-11-25 This book contains some of the contributions that have been carefully selected and peer reviewed which were presented at the International Symposium MME06 Mathematical Methods in Engineering held in Cankaya University Ankara April 2006 The Symposium provided a setting for discussing recent developments in Fractional Mathematics Neutrices and Generalized Functions Boundary Value Problems Applications of Wavelets Dynamical Systems and Control Theory **Fluorescence Fluctuation**

**Spectroscopy (FFS), Part A**, 2012-12-28 This new volume of Methods in Enzymology continues the legacy of this premier serial by containing quality chapters authored by leaders in the field This volume covers Fluorescence Fluctuation Spectroscopy Contains chapters on such topics as Time integrated fluorescence cumulant analysis Pulsed Interleaved Excitation and raster image correlation spectroscopy and number and brightness analysis Continues the legacy of this premier serial with quality chapters authored by leaders in the field Covers fluorescence fluctuation spectroscopy Contains chapters on such topics as time integrated fluorescence cumulant analysis pulsed interleaved excitation and raster image correlation spectroscopy and number and brightness analysis Recent Advances In Computational Science And

Engineering - Proceedings Of The International Conference On Scientific And Engineering Computation (Ic-sec) 2002 Justin Kwok, Heow-pueh Lee, Kurichi Kumar, 2002-12-02 IC SEC 2002 serves as a forum for engineers and scientists who are involved in the use of high performance computers advanced numerical strategies computational methods and simulation in various scientific and engineering disciplines The conference creates a platform for presenting and discussing the latest trends and findings about the state of the art in their particular fields of interest IC SEC also provides a forum for the interdisciplinary blending of computational efforts in various diversified areas of science such as biology chemistry physics and materials science as well as all branches of engineering The proceedings cover a broad range of topics and an application area which involves modelling and simulation work using high performance computers Gas Chromatographic Techniques and Applications

Alan John Handley, E. R. Adlard, 2001 This volume provides an overview of the state of the art in gas chromatography with an emphasis on new technologies The authors all drawn from respected industrial and academic laboratories consider developments in gas chromatographic techniques over the last decade Application areas are addressed within individual chapters **Methods in Enzymology** Christophe Henri Werner Hirs, Serge N. Timasheff, 1986

**Chemometrics-based Spectroscopy for Pharmaceutical and Biomedical Analysis** Hoang Vu Dang, Federico Marini, 2019-04-17 Chemometrics is the application of mathematics and statistics to chemical data in order to design or select optimal experimental procedures to provide maximum relevant information and to obtain knowledge about systems under study This chemical discipline has constantly developed to become a mature field of Analytical Chemistry after its inception in the 1970s The utility and versatility of chemometric techniques enable spectroscopists to perform

multidimensional classification and or calibration of spectral data that make identification and quantification of analytes in complex mixtures possible Wavelets are mathematical functions that cut up data into different frequency components and then study each component with a resolution matched to its scale They are now being adapted for a vast number of signal processing due to their unprecedented success in terms of asymptotic optimality spatial adaptivity and computational efficiency In analytical chemistry they have increasingly shown great applicability and have been preferred over existing signal processing algorithms in noise removal resolution enhancement data compression and chemometrics modeling in chemical studies The aim of this Research Topic is to present state of the art applications of chemometrics in the field of spectroscopy with special attention to the use of wavelet transform Both reviews and original research articles on pharmaceutical and biomedical analysis are welcome in the specialty section Analytical Chemistry

**Fluorescence Assay in Biology and Medicine** Sidney Udenfriend, 2014-05-27 Molecular Biology An International Series of Monographs and Textbooks Fluorescence Assay in Biology and Medicine Volume II covers the many applications of fluorescence and phosphorescence This book discusses the principles of fluorescence polarization comparison of luminescence methods of analysis and direct measurement of fluorescence decay times The photodecomposition of sulfhydryl compounds determination of primary structure and fluorescent staining are also deliberated This text likewise covers the assay of purines in nucleic acid hydrolyzates formyltetrahydrofolate synthetase and ovarian hormones This volume is valuable to chemists physicists and biophysicists intending to use fluorescence in studying reaction mechanisms and elucidate the structure of complex biopolymers

Crime Laboratory Digest, 1984 CRC Handbook of Optical Resolutions via Diastereomeric Salt Formation David Kozma, 2001-10-18 Optically active compounds are gaining ever increasing importance in organic chemistry both in the academic and the industrial arenas The rational synthesis of the growing number of chiral chemicals drugs and natural products demands efficient methods for producing these compounds in an enantiomerically highly pure form Despite the available

*Novel Optical Resolution Technologies* Kenichi Sakai, Noriaki Hirayama, Rui Tamura, 2007-02-15 After the end of the 20th century the science of crystallization reached a truly exciting stage where new opportunities emerged in both theory and experiment Various physical methods are capable of resolving the surface as well as the inside structure of crystals at the atomic level while new high performance computing resources afford the capability of modeling the complex large scale alignments necessary to simulate crystallization in real systems As a result the science of crystallization has shifted gradually from static to dynamic science and considerable progress now underlies the complex but beautiful crystallization process I believe that if a definitive history of 21st century science is ever written one of the highlights will be the science of crystallization This science has the following characteristics in its advances in sophistication unlimited opportunities not only for intellectual excitement but also for industrial merit strong collaboration with biology and materials science as

well as with all areas of chemistry. The vast potential of crystallization as a part of science is far beyond the simple technology of pharmaceutical industries during the 20th century. Optical resolution was one small area of chemistry in the last century. This was more a technology than a science largely because trial and error was the only method to obtain good results. However, the situation is now changing. There are so many appealing hidden findings in the process of crystallization. Historically, crystallization began in an old laboratory in academia and then gradually shifted to industry. Now it is making its comeback in academia due to several new research branches trying to discover what is going on during the crystallization process. I believe this old of science is now growing as a result of the wonderful coupling between industry and academia. I read a prepublication draft of *Novel Optical Resolution Technologies* and found that each one of these general characteristics of science had a reality and sharpness that I had not expected. While it was a sheer delight to revisit each of these triumphs guided by the wise insights and analyses found throughout the book, there is a good balance between the underlying historical material and the design and execution aspects of each topic.

**Lasers in Chemical Analysis** Gary M. Hieftje, John C. Travis, Fred E. Lytle, 2012-12-06  
 Lasers are relatively recent additions to the analytical scientist's arsenal. Because of this, many analysts, whether their concern is research or some range of applications, are in need of a tutorial introduction not only to the principles of lasers, their optics and radiation, but also to their already diverse and burgeoning applications. The articles presented in this volume, carefully enhanced and edited from lectures prepared for the ACS Division of Analytical Chemistry 1979 Summer Symposium, are designed to provide just such a broad introduction to the subject. Thus, in addition to several excellent chapters on laser fundamentals, there are many practically oriented articles dealing with laser analytical methodology including techniques based on the absorption of laser radiation, on laser-induced fluorescence, and on some of the uses of lasers in chemical instrumentation. The first of these sections is pivotal and reflects in part our philosophy in organizing this collection. The authors of the initial chapters were invited not only because of their expertise in the field of lasers and analytical chemistry, but also because their didactic approach to writing and their clarity of presentation were well known to us. It is our hope that individual readers with little knowledge of lasers will gain from these introductory chapters sufficient information to render the later, more detailed articles both useful and meaningful.

**Physical Biochemistry** David Sheehan, 2013-04-30  
 As will be seen, there is not much missing here. I thought that the sections were well balanced with rarely too much or too little on a given topic. This is a text to be welcomed by both teachers and students.

**BIOCHEMISTRY MOLECULAR BIOLOGY EDUCATION**  
 on the first edition. The second edition of this successful textbook explains the basic principles behind the key techniques currently used in the modern biochemical laboratory and describes the pros and cons of each technique and compares one to another. It is non-mathematical, comprehensive, and approachable for students who are not physical chemists. A major update of this comprehensive, accessible introduction to physical biochemistry includes two new chapters on proteomics and bioinformatics. Introduces experimental approaches with a minimum of mathematics and numerous practical

examples Provides a bibliography at the end of each chapter Written by an author with many years teaching and research experience this text is a must have for students of biochemistry biophysics molecular and life sciences and food science

**Journal** Oil and Colour Chemists' Association (Great Britain),1952      *Forensic Analysis of Fire Debris and Explosives* Kenyon Evans-Nguyen,Katherine Hutches,2019-10-08 This text provides training on the fundamental tools and methodologies used in active forensic laboratories for the complicated analysis of fire debris and explosives evidence It is intended to serve as a gateway for students and transitioning forensic science or chemistry professionals The book is divided between the two disciplines of fire debris and explosives with a final pair of chapters devoted to the interplay between the two disciplines and with other disciplines such as DNA and fingerprint analysis It brings together a multi national group of technical experts ranging from academic researchers to active practitioners including members of some of the premier forensic agencies of the world Readers will gain knowledge of practical methods of analysis and will develop a strong foundation for laboratory work in forensic chemistry End of chapter questions based on relevant topics and real world data provide a realistic arena for learners to test newly acquired techniques      **Comprehensive Chemometrics** Steven Brown,Roma Tauler,Beata Walczak,2020-05-26 Comprehensive Chemometrics Second Edition Four Volume Set features expanded and updated coverage along with new content that covers advances in the field since the previous edition published in 2009 Subject of note include updates in the fields of multidimensional and megavariate data analysis omics data analysis big chemical and biochemical data analysis data fusion and sparse methods The book follows a similar structure to the previous edition using the same section titles to frame articles Many chapters from the previous edition are updated but there are also many new chapters on the latest developments Presents integrated reviews of each chemical and biological method examining their merits and limitations through practical examples and extensive visuals Bridges a gap in knowledge covering developments in the field since the first edition published in 2009 Meticulously organized with articles split into 4 sections and 12 sub sections on key topics to allow students researchers and professionals to find relevant information quickly and easily Written by academics and practitioners from various fields and regions to ensure that the knowledge within is easily understood and applicable to a large audience Presents integrated reviews of each chemical and biological method examining their merits and limitations through practical examples and extensive visuals Bridges a gap in knowledge covering developments in the field since the first edition published in 2009 Meticulously organized with articles split into 4 sections and 12 sub sections on key topics to allow students researchers and professionals to find relevant information quickly and easily Written by academics and practitioners from various fields and regions to ensure that the knowledge within is easily understood and applicable to a large audience      *Comprehensive Chiroptical Spectroscopy, Volume 2* Nina Berova,Prasad L. Polavarapu,Koji Nakanishi,Robert W. Woody,2012-03-27 This book provides an introduction to the important methods of chiroptical spectroscopy in general and circular dichroism CD in particular which are increasingly important in all areas of chemistry

biochemistry and structural biology The book can be used as a text for undergraduate and graduate students and as a reference for researchers in academia and industry Experimental methods and instrumentation are described with topics ranging from the most widely used methods electronic and vibrational CD to frontier areas such as nonlinear spectroscopy and photoelectron CD as well as the theory of chiroptical methods and techniques for simulating chiroptical properties Applications of chiroptical spectroscopy to problems in organic stereochemistry inorganic stereochemistry and biochemistry and structural biology are also discussed and each chapter is written by one or more leading authorities with extensive experience in the field      *Manual of Standard Procedures* John H. Harley, 1970



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