

Redox Stoichiometry (Titrations)

- In a redox titration, a known concentration of an oxidizing agent is used to find an unknown concentration of a reducing agent, or vice-versa.
- Applications include finding the iron content of water or the Vitamin C content in foods.

General Steps:

1. Balance the redox equation
2. Organize data for the given and required substances
3. Find the moles of the given substance
If given volume and concentration, use $n = Cv$
If given mass, find molar mass, then use $n = m/M$
4. Find the moles of the required substances, using mole ratio
5. Convert moles to concentration ($C = n/v$) or volume ($v = n/C$) or mass ($m = nM$) of required substance

Example 1:

The following example involves the titration of a solution of sodium oxalate, $\text{Na}_2\text{C}_2\text{O}_4(\text{aq})$ with a solution of potassium permanganate, $\text{KMnO}_4(\text{aq})$.

Important Note:

- The permanganate ion, MnO_4^- , is often used as an oxidizing agent because of its deep purple color.
- It acts as its own indicator.
- It is reduced to pale pink Mn^{2+} by the oxalate ions.
- Once all oxalate ions have been oxidized the next drop of permanganate ions turns the solution a faint purple color, signaling the endpoint of the titration.

Find the **volume** of 0.200 M solution of MnO_4^- which will react with 50.0 mL of 0.100 M solution of $\text{C}_2\text{O}_4^{2-}$.



Example 2:

A 23.30 ml sample of KMnO_4 solution is decolorized by 0.1111g of oxalic acid ($\text{H}_2\text{C}_2\text{O}_4$). The products are Mn^{2+} and CO_2 gas. Calculate the concentration of KMnO_4 using the following equation:

Example 3:

The oxidation of Fe^{2+} ions by permanganate in acidic solution is accompanied by the formation of Fe^{3+} ions and Mn^{2+} ions. How many moles of FeSO_4 would be oxidized by 100.0 ml of 0.02118 mol/L KMnO_4 solution.



Redox Stoichiometry Worksheet

Didier Musso



Redox Stoichiometry Worksheet:

General Chemistry Workbook Daniel C. Tofan, 2010-07-28 This workbook is a comprehensive collection of solved exercises and problems typical to AP introductory and general chemistry courses as well as blank worksheets containing further practice problems and questions It contains a total of 197 learning objectives grouped in 28 lessons and covering the vast majority of the types of problems that a student will encounter in a typical one year chemistry course It also contains a fully solved 50 question practice test which gives students a good idea of what they might expect on an actual final exam covering the entire material

Chemistry Carson-Dellosa Publishing, 2015-03-16 Chemistry for grades 9 to 12 is designed to aid in the review and practice of chemistry topics Chemistry covers topics such as metrics and measurements matter atomic structure bonds compounds chemical equations molarity and acids and bases The book includes realistic diagrams and engaging activities to support practice in all areas of chemistry The 100 Series science books span grades 5 to 12 The activities in each book reinforce essential science skill practice in the areas of life science physical science and earth science The books include engaging grade appropriate activities and clear thumbnail answer keys Each book has 128 pages and 100 pages or more of reproducible content to help students review and reinforce essential skills in individual science topics The series will be aligned to current science standards

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Introduction to Chemistry, Laboratory Manual T. R. Dickson, 1994-12-23 Teaches chemistry by offering a dynamic provocative and relevant view of the topic and its importance to society and our daily lives Three themes are stressed throughout the text developing chemical thinking and a chemical vision learning problem solving methods and utilizing group work and discussion activities These themes involve and engage the students in their own learning processes they are challenged to be active The presentation of topics has been altered to include a new chapter which introduces the students to scientific thinking and shows that chemistry involves interesting and relevant topics The reorganization presents many core concepts in the first five chapters preparing students for later chapters In addition the author has added vignettes throughout the chapters referring to health technology the environment and society as well as to specific tools of direct use to students

Chemistry Homework Frank Schaffer Publications, Joan DiStasio, 1996-03 Includes the periodic table writing formulas balancing equations stoichiometry problems and more

Basics of Analytical Chemistry and Chemical Equilibria Brian M. Tissue, 2013-06-06 Enables students to progressively build and apply new skills and knowledge Designed to be completed in one semester this text enables students to fully grasp and apply the core concepts of analytical chemistry and aqueous chemical equilibria Moreover the text enables readers to master common instrumental methods to perform a broad range of quantitative analyses Author Brian Tissue has written and structured the text so that readers progressively build their knowledge beginning with the most fundamental concepts and then continually applying these concepts as they advance to more sophisticated theories and applications Basics of Analytical Chemistry and Chemical Equilibria is clearly written and easy to follow with plenty of examples to help readers better understand both concepts and applications In addition there are several pedagogical features that enhance the learning experience including Emphasis on correct IUPAC terminology You Try It spreadsheets throughout the text challenging readers to apply their newfound knowledge and skills Online tutorials to build readers skills and assist them in working with the text s spreadsheets Links to analytical methods and instrument suppliers Figures illustrating principles of analytical chemistry and chemical equilibria End of chapter exercises Basics of Analytical Chemistry and Chemical Equilibria is written for undergraduate students who have completed a basic course in general chemistry In addition to chemistry students this text provides an essential foundation in analytical chemistry needed by students and practitioners in biochemistry environmental science chemical engineering materials science nutrition agriculture and the life sciences

Fire Behavior and Combustion Processes with Advantage Access Raymond Shackelford, Alfred J. Rager, Jeffery J. Zolfarelli, 2023-11-06 Fire Behavior and Combustion Processes was designed to provide a straight forward yet comprehensive resource for students enrolled in fire science degree programs or as a refresher for active firefighters It provides an understanding of the basic principles of fire chemistry the processes of fire combustion and fire behavior The subject of fire behavior is often a complex one and this book seeks to clarify theoretical concepts explain their importance and illustrate how they can be applied in a practical way when responding to emergency situations Formulation and Stoichiometry Emil J. Margolis, 2012-12-06 The purpose of this book is to interpret more sensitively some of the offerings of the standard text book of general chemistry As a supplement thereto it covers various aspects of formulation and stoichiometry that are frequently treated far too perfunctorily or in many instances are not considered at all The inadequate attention often accorded by the comprehensive text to many topics within its proper purview arises understandably enough from the numerous broad and highly varied objectives set for the first year of the curriculum for modern chemistry in colleges and universities For the serious student this means more often than not the frustrations of questions unanswered The amplification that this book proffers in the immediate area of its subject covers the equations representing internal redox reactions not only of the simple but also of the multiple disproportionations of which the complexities often discourage an undertaking despite the challenge they offer distinctions to be observed in the balancing of equations in contrasting alkali

basic and ammonia basic reaction media quantitative contributions made by the ionization or dissociation effects of electrolytes to the colligative properties of their solutions intensive application of the universal reaction principle of chemical equivalence to the stoichiometry of oxidation and reduction *Principles of Redox Reactions* Malika Ammam,2018-03-05 As a teacher of physical chemistry I noticed that students even in advanced classes have difficulties in understanding the basics of redox chemistry In this Section 3 I attempted to discuss some fundamental principles related to redox processes by focusing on the species that might lose or gain electrons determination of the oxidation numbers or states of atoms in compounds and ways of balancing redox reactions To further clarify the discussed concepts numerous questions and problems with detailed answers are provided Most of these questions are formulated by students like you I believe that this Section 3 would greatly help students with levels varying from high school to advanced university classes Redox Mohammed Awad Ali Khalid,2017-09-06 Redox reactions are central to the major element cycling many cell cycles many chemisorption and physisorption processes trace element mobility from rocks and sediments toward wells aquifers trace element toxicity toward life forms and most remediation schemes including water treatments over the last three decades the field has attracted a lot of scientists and a great deal of researches has been done in redox chemistry This book provides a very broad overview of the state of the art of understanding redox processes which starts with giving a concise introduction that describes the origin historical background and the development of the redox definitions The book is organized into two sections that include ten chapters and introduces in Section 1 generalized electron balance theory and its applications in electrolytic redox systems redox active molecules and its applications in device memory fundamentals and applications of flow batteries and their integration into antidirect current and donor acceptor titrations of displacement and electronic transference Section 2 introduces redox in biological processes including roles of reactive oxygen species in respiration metabolism and regulations and redox in physiological processes as redox sensitive TRP channels TRPA1 and TRPM2 All chapters are written by different authors with the exception of Chapter 1 Introduction This clearly reflects the broad range of topics that have been covered by experts in the field *Redox Models in Chemistry* Lise-Lotte Österlund,Margareta Ekborg,Anders Berg,2010 **Sustainable and Functional Redox Chemistry** Shinsuke Inagi,2022-04-29 Mimicking nature's efficiency and sustainability in organic chemistry is a major goal for future chemists redox reactions are a key element in a variety of fields ranging from synthesis and catalysis to materials chemistry and analytical applications Sustainability is increasingly becoming a consideration in synthesis and functional chemistry and an essential element for the next generation of chemistry in academia and industry This book represents a compilation of the latest advancements in functional redox chemistry and demonstrates its importance in achieving a more sustainable future This book is an ideal companion for any postgraduate students or researchers interested in sustainability in academia and industry

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