

Chapter 16 Redox chemistry and corrosion

Q1.

Identify each of the following half equations as involving either oxidation or reduction:

- a $\text{Na(s)} \rightarrow \text{Na}^+(\text{aq}) + \text{e}^-$
- b $\text{Cl}_2(\text{g}) + 2\text{e}^- \rightarrow 2\text{Cl}^-(\text{aq})$
- c $\text{S(s)} + 2\text{e}^- \rightarrow \text{S}^{2-}(\text{aq})$
- d $\text{Zn(s)} \rightarrow \text{Zn}^{2+}(\text{aq}) + 2\text{e}^-$

A1.

- a oxidation
- b reduction
- c reduction
- d oxidation

Q2.

Balance the following half equations and then identify each as representing either an oxidation or a reduction reaction:

- a $\text{Fe(s)} \rightarrow \text{Fe}^{3+}(\text{aq})$
- b $\text{K(s)} \rightarrow \text{K}^+(\text{aq})$
- c $\text{F}_2(\text{g}) \rightarrow \text{F}^-(\text{aq})$
- d $\text{O}_2(\text{g}) \rightarrow \text{O}^{2-}(\text{aq})$

A2.

- a $\text{Fe(s)} \rightarrow \text{Fe}^{3+}(\text{aq}) + 3\text{e}^-$ oxidation
- b $\text{K(s)} \rightarrow \text{K}^+(\text{aq}) + \text{e}^-$ oxidation
- c $\text{F}_2(\text{g}) + 2\text{e}^- \rightarrow 2\text{F}^-(\text{aq})$ reduction
- d $\text{O}_2(\text{g}) + 4\text{e}^- \rightarrow 2\text{O}^{2-}(\text{aq})$ reduction

Q3.

Iron reacts with hydrochloric acid according to the ionic equation:



- a What has been oxidised in this reaction? What is the product?
- b Write a half equation for the oxidation reaction.
- c Identify the oxidant.
- d What has been reduced in this reaction? What is the product?
- e Write a half equation for the reduction reaction.
- f Identify the reductant.

A3.

- a Fe(s) has been oxidised to $\text{Fe}^{2+}(\text{aq})$
- b $\text{Fe(s)} \rightarrow \text{Fe}^{2+}(\text{aq}) + 2\text{e}^-$
- c $\text{H}^+(\text{aq})$
- d $\text{H}^+(\text{aq})$ has been reduced to H_2
- e $2\text{H}^+(\text{aq}) + 2\text{e}^- \rightarrow \text{H}_2(\text{g})$
- f Fe(s)

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James E. House



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Techniques in Clinical Chemistry Frederick N. Bullock, 2013-10-22 *Techniques in Clinical Chemistry A Handbook for Medical Laboratory Technicians* is a five chapter supplementary handbook on the fundamentals of medical laboratory test and protocols. The opening chapter covers the fundamental aspects of medical laboratories including accuracy measures, methods of analysis, buffers, indicators, and valency. These topics are followed by discussions on the procedures for preliminary preparation, primarily for sample preparation and specimen collection. Considerable chapters are devoted to the scrutinized analysis of specific specimen such as blood, cerebrospinal fluid, feces, gastric sample, and urine. The final chapter discusses technical essentials of renal and hepatic function tests. This handbook is directed toward medical and laboratory technicians and clinicians.

Electrochemistry and Corrosion Science Nestor Perez, 2016-09-13 The second edition of this textbook includes refined text in each chapter, new sections on corrosion of steel reinforced concrete and on cathodic protection of steel reinforced bars embedded in concrete, and some new solved examples. The book introduces mathematical and engineering approximation schemes for describing the thermodynamics and kinetics of electrochemical systems, which are the essence of corrosion science, in addition to electrochemical corrosion forms of corrosion and mechanisms of corrosion. This approach should capture the reader's attention on the complexity of corrosion. Thus, the principles of electrochemistry and electrochemical cells are subsequently characterized in simple electrolytes from a thermodynamics point of view.

Solution Processing of Inorganic Materials David Mitzi, 2008-12-22 Discover the materials set to revolutionize the electronics industry. The search for electronic materials that can be cheaply solution processed into films while simultaneously providing quality device characteristics represents a major challenge for materials scientists. Continuous semiconducting thin films with large carrier mobilities are particularly desirable for high speed microelectronic applications, potentially providing new opportunities for the development of low cost, large area flexible computing devices, displays, sensors, and solar cells. To date, the majority of solution processing research has focused on molecular and polymeric organic films. In contrast, this book reviews recent achievements in the search for solution processed inorganic semiconductors and other critical electronic components. These components offer the potential for better performance and more robust thermal and mechanical stability than comparable organic based systems. *Solution Processing of Inorganic Materials* covers everything from the more traditional fields of sol-gel processing and chemical bath deposition to the cutting edge use of nanomaterials in thin film deposition. In particular, the book focuses on materials and techniques that are compatible with high throughput, low cost, and low temperature deposition processes such as spin coating, dip coating, printing, and stamping. Throughout the text, illustrations and examples of applications are provided to help the reader fully appreciate the concepts and opportunities involved in this exciting field. In addition to presenting the state of the art research, the book offers extensive background material. As a result, any researcher involved or interested in electronic device fabrication can turn to

this book to become fully versed in the solution processed inorganic materials that are set to revolutionize the electronics industry

Electroanalytical Chemistry Gary A. Mabbott, 2020-01-27 Provides a strong foundation in electrochemical principles and best practices Written for undergraduate majors in chemistry and chemical engineering this book teaches the basic principles of electroanalytical chemistry and illustrates best practices through the use of case studies of organic reactions and catalysis using voltammetric methods and of the measurement of clinical and environmental analytes by potentiometric techniques It provides insight beyond the field of analysis as students address problems arising in many areas of science and technology The book also emphasizes electrochemical phenomena and conceptual models to help readers understand the influence of experimental conditions and the interpretation of results for common potentiometric and voltammetric methods *Electroanalytical Chemistry Principles Best Practices and Case Studies* begins by introducing some basic concepts in electrical phenomena It then moves on to a chapter that examines the potentiometry of oxidation reduction processes followed by another on the potentiometry of ion selective electrodes Other sections look at applications of ion selective electrodes controlled potential methods case studies in controlled potential methods and instrumentation The book also features several appendixes covering Ionic Strength Activity and Activity Coefficients The Nicolsky Eisenman Equation The Henderson Equation for Liquid Junction Potentials Selected Standard Electrode Potentials and The Nernst Equation Derivation Introduces the principles of modern electrochemical sensors and instrumental chemical analysis using potentiometric and voltammetric methods Develops conceptual models underlying electrochemical phenomena and useful equations Illustrates best practice with short case studies of organic reaction mechanisms using voltammetry and quantitative analysis with ion selective electrodes Offers instructors the opportunity to select focus areas and tailor the book to their course by providing a collection of shorter texts each dedicated to a single field Intended as one of a series of modules for teaching undergraduate courses in instrumental chemical analysis *Electroanalytical Chemistry Principles Best Practices and Case Studies* is an ideal textbook for undergraduate majors in chemistry and chemical engineering taking instrumental analysis courses It would also benefit professional chemists who need an introduction to potentiometry or voltammetry

The Chemistry and Technology of Gelatin and Glue Robert Herman Bogue, 1922 *14th International Symposium on Industrial Crystallization*, 1999 This conference provides a forum for discussion of the advances in the theory and practice of crystallization as it relates to the production of bulk crystalline materials

Mixtures and Solutions Carol Ballard, 2009-07-01 Introduces mixtures and solutions including the different types of mixtures how they are used in everyday life and how they can be physically and chemically separated

Multi-Component Crystals Edward Tiekink, Julio Zukerman-Schpector, 2017-11-20 In this volume contributions covering the theoretical and practical aspects of multicomponent crystals provide a timely and contemporary overview of the state of the art of this vital aspect of crystal engineering materials science With a solid foundation in fundamentals multi component crystals can be formed for example

to enhance pharmaceutical properties of drugs for the specific control of optical responses to external stimuli and to assemble molecules to allow chemical reactions that are generally intractable following conventional methods

Contents

Pharmaceutical co crystals crystal engineering and applications Pharmaceutical multi component crystals improving the efficacy of anti tuberculous agents Qualitative and quantitative crystal engineering of multi functional co crystals Control of photochromism in N salicylideneaniline by crystal engineering Quinoline derivatives for multi component crystals principles and applications N oxides in multi component crystals and in bottom up synthesis and applications Multi component crystals and non ambient conditions Co crystals for solid state reactivity and thermal expansion Solution co crystallisation and its applications The salt co crystal continuum in halogen bonded systems Large horizontal displacements of benzene benzene stacking interactions in co crystals Simultaneous halogen and hydrogen bonding to carbonyl and thiocarbonyl functionality Crystal chemistry of the isomeric N N bis pyridin n ylmethyl ethanediamides n 2 3 or 4 Solute solvent interactions mediated by main group element lone pair aryl interactions

Comprehensive Nuclear Materials, 2020-07-22

Materials in a nuclear environment are exposed to extreme conditions of radiation temperature and or corrosion and in many cases the combination of these makes the material behavior very different from conventional materials This is evident for the four major technological challenges the nuclear technology domain is facing currently i long term operation of existing Generation II nuclear power plants ii the design of the next generation reactors Generation IV iii the construction of the ITER fusion reactor in Cadarache France iv and the intermediate and final disposal of nuclear waste In order to address these challenges engineers and designers need to know the properties of a wide variety of materials under these conditions and to understand the underlying processes affecting changes in their behavior in order to assess their performance and to determine the limits of operation *Comprehensive Nuclear Materials* Second Edition Seven Volume Set provides broad ranging validated summaries of all the major topics in the field of nuclear material research for fission as well as fusion reactor systems Attention is given to the fundamental scientific aspects of nuclear materials fuel and structural materials for fission reactors waste materials and materials for fusion reactors The articles are written at a level that allows undergraduate students to understand the material while providing active researchers with a ready reference resource of information Most of the chapters from the first Edition have been revised and updated and a significant number of new topics are covered in completely new material During the ten years between the two editions the challenge for applications of nuclear materials has been significantly impacted by world events public awareness and technological innovation Materials play a key role as enablers of new technologies and we trust that this new edition of *Comprehensive Nuclear Materials* has captured the key recent developments Critically reviews the major classes and functions of materials supporting the selection assessment validation and engineering of materials in extreme nuclear environments Comprehensive resource for up to date and authoritative information which is not always available elsewhere even in journals Provides an in depth treatment of

materials modeling and simulation with a specific focus on nuclear issues Serves as an excellent entry point for students and researchers new to the field

A Dictionary of Applied Chemistry Thomas Edward Thorpe,1912 Journal of the Air Pollution Control Association Air Pollution Control Association,1965

Handbook of Anion Determination W John Williams,2013-10-22 Handbook of Anion Determination is a guidebook that details various methods that can be employed in determining anions The book is comprised of 62 chapters that are organized into four parts The text first covers general anions which include fluorosilicate perruthenate and vanadate The second part deals with halogen anions such as perchlorate perbromate and iodide Part III presents phosphorus oxyanions including orthophosphate monofluorophosphate and hexafluorophosphate The last part covers sulfur anions which include peroxodisulfate polysulfide and polythionates The book will be of great use to scientists from a wide range of scientific disciplines including biology physics metallurgy and engineering

Inorganic Chemistry James E. House,2025-01-27 Inorganic Chemistry Fourth Edition provides essential information for students of inorganic chemistry and is updated throughout The presentation of topics is made with an effort to be clear and concise so that the book is portable and user friendly The text emphasizes fundamental principles including molecular structure acid base chemistry coordination chemistry ligand field theory and solid state chemistry It is organized into five major themes structure condensed phases solution chemistry main group and coordination compounds with several chapters in each There is a logical progression from atomic structure to molecular structure to properties of substances based on molecular structures to behavior of solids etc The textbook contains a balance of topics in theoretical and descriptive chemistry For example the hard soft interaction principle is used to explain hydrogen bond strengths strengths of acids and bases stability of coordination compounds etc Discussion of elements begins with survey chapters focused on the main groups while later chapters cover the elements in greater detail Each chapter opens with narrative introductions and includes figures tables and end of chapter problem sets This new edition features updates throughout with an emphasis on bioinorganic chemistry and a new chapter on nanostructures and graphene More in text worked out examples encourage active learning and prepare students for their exams This text is ideal for advanced undergraduate and graduate level students enrolled in the Inorganic Chemistry course This core course serves Chemistry and other science majors The book may also be suitable for biochemistry medicinal chemistry and other professionals who wish to learn more about this subject area Physical chemistry is incorporated to show the relevant principles from bonding theory and thermodynamics while also emphasizing the chemical characteristics of main group elements and coordination chemistry An extensive revision to the bioinorganic chemistry chapter brings the student up to date on cutting edge research Discussion of elements begins with survey chapters focused on the main groups while later chapters cover the elements in greater detail Each chapter opens with narrative introductions and includes figures tables and end of chapter problem sets New to this edition More descriptive language sentences flow more logically than they do in numerous chemistry books Additional coverage on topics as

photovoltaic compounds metal oxide catalysts superconductivity flame fusion synthesis splitting water nanoparticles synthesis and use high temperature syntheses Updated end of chapter exercises **Mineral Scales and Deposits** Zahid Amjad, Konstantinos D. Demadis, 2015-05-21 Mineral Scales and Deposits Scientific and Technological Approaches presents in an integrated way the problem of scale deposits precipitation crystallization of sparingly soluble salts in aqueous systems both industrial and biological It covers several fundamental aspects also offering an applications perspective with the ultimate goal of helping the reader better understand the underlying mechanisms of scale formation while also assisting the user reader to solve scale related challenges It is ideal for scientists experts working in academia offering a number of crystal growth topics with an emphasis on mechanistic details prediction modules and inhibition dispersion chemistry amongst others In addition technologists consultants plant managers engineers and designers working in industry will find a field friendly overview of scale related challenges and technological options for their mitigation Provides a unique detailed focus on scale deposits includes the basic science and mechanisms of scale formation Present a field friendly overview of scale related challenges and technological options for their mitigation Correlates chemical structure to performance Provides guidelines for easy assessment of a particular case also including solutions Includes an extensive list of industrial case studies for reference **Chemical Ideas** George Burton, 2000 This advanced chemistry text has been updated to match the specification for A Level Chemistry from September 2000 The problems have been revised and graded to allow more differentiation helping the teacher to teach students of a wide range of abilities The new editions of all the texts in this series should make it easier for teachers to match their teaching to the new modular specification There are new activities to cover ICT and key skills and end of unit tests to give students practice **Index Medicus** , 2003 Vols for 1963 include as pt 2 of the Jan issue Medical subject headings *Physico-chemical Methods* Joseph Reilly, William Norman Rae, 1943

Australian national bibliography , 1961 **Handbook of Industrial Crystallization** Allan Myerson, 2002-01-08 Crystallization is an important separation and purification process used in industries ranging from bulk commodity chemicals to specialty chemicals and pharmaceuticals In recent years a number of environmental applications have also come to rely on crystallization in waste treatment and recycling processes The authors provide an introduction to the field of newcomers and a reference to those involved in the various aspects of industrial crystallization It is a complete volume covering all aspects of industrial crystallization including material related to both fundamentals and applications This new edition presents detailed material on crystallization of biomolecules precipitation impurity crystal interactions solubility and design Provides an ideal introduction for industrial crystallization newcomers Serves as a worthwhile reference to anyone involved in the field Covers all aspects of industrial crystallization in a single complete volume **A Dictionary of Applied Chemistry** Sir Thomas Edward Thorpe, 1922

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