

POGIL 2: Ions

How are ions made from neutral atoms?

You have learned that not all atoms of an element are the same. Variation in the number of neutrons results in different isotopes of the element. In this activity, we will explore another variation that can take place—the loss and gain of electrons. The exchange of electrons between atoms is a very common way for chemical change to take place. We will see it many times throughout the year.

- Use Diagram 1 on the next page to complete the following table.

	Metal or Nonmetal	Number of protons in the atom	Number of protons in the ion	Number of neutrons in the atom	Number of neutrons in the ion	Number of electrons in the atom	Number of electrons in the ion	Charge on the ion
Lithium	Metal	3	3	4	4	3	2	3+
Magnesium	Metal	12	12	12	12	12	10	2+
Aluminum	Metalloid	13	13	14	14	13	10	3+
Phosphorus	Non metal	15	15	16	16	15	16	3-
Oxygen	Non metal	8	8	8	8	8	10	2-
Nitrogen	Non metal	7	7	7	7	7	10	3-

- Based on the table you completed in Question 1, what distinguishes a neutral atom from an ion?
A neutral atom has the same number of protons and electrons (no charge). An ion has a charge (# of protons does not equal # of electrons).
- Examine the isotope symbols in Diagram 1.
 - Where is the ion charge located in the isotope symbol?
Top right corner
 - Is a charge indicated on the neutral atom? If yes, where is it located?
No
 - Which subatomic particle carries a positive charge?
Protons are positive
 - Which subatomic particle carries a negative charge?
Electrons are negative
 - Propose a mathematical equation to calculate the charge on an ion from the number of protons and electrons in an ion. Confirm that your equation works using two positive ion examples and two negative ion examples from Diagram 1.
The charge of an ion = # of protons - # of electrons

Ions Pogil Key

R. W. Gurney

Ions Pogil Key:

Analytical Chemistry Juliette Lantz, Renée Cole, The POGIL Project, 2014-12-31 An essential guide to inquiry approach instrumental analysis Analytical Chemistry offers an essential guide to inquiry approach instrumental analysis collection The book focuses on more in depth coverage and information about an inquiry approach This authoritative guide reviews the basic principles and techniques Topics covered include method of standard the microscopic view of electrochemistry calculating cell potentials the BerryLambert atomic and molecular absorption processes vibrational modes mass spectra interpretation and much more

Chemical Pedagogy Keith S Taber, 2024-12-20 How should chemistry be taught in schools colleges and universities Chemical Pedagogy discusses teaching approaches and techniques the reasoning behind them and the evidence for their effectiveness The book surveys a wide range of different pedagogic strategies and tactics that have been recommended to better engage learners and provide more effective chemistry teaching These accounts are supported by an initial introduction to some key ideas and debates about pedagogy the science of teaching Chemical Pedagogy discusses how teaching innovations can be tested to inform research based practice Through this book the author explores the challenges of carrying out valid experimental studies in education and the impediments to generalising study results to diverse teaching and learning contexts As a result the author highlights both the need to read published studies critically and the value of teachers and lecturers testing out recommended innovations in their own classrooms Chemical Pedagogy introduces core principles from research into human cognition and learning to provide a theoretical perspective on how to best teach for engagement and understanding An examination of some of the more contentious debates about pedagogy leads to the advice to seek optimally guided instruction which balances the challenge offered to learners with the level of support provided This provides a framework for discussing a wide range of teaching approaches and techniques that have been recommended to those teaching chemistry across educational levels including both those intended to replace teaching from the front and others that can be built into traditional lecture courses to enhance the learning experience

Ions in Solution Ronald Wilfrid Gurney, 1936

Ions and Light Michael T. Bowers, 2013-10-22 Gas Phase Ion Chemistry Volume 3

Ions and Light discusses how ions are formed by electron impact ion molecule reactions or electrical discharge This book discusses the use of light emitted by excited molecules to characterize either the chemistry that formed the excited ion the structure of the excited ion or both Organized into 10 chapters this volume begins with an overview of the extension of the classical flowing afterglow technique to include infrared and chemiluminescence and laser induced fluorescence detection This text then examines the experiments involving molecules that are isolated from collisions for periods exceeding several milliseconds Other chapters consider the photodetachment in negative ion beams and the chemical information that can be obtained from such studies This book discusses as well the electronic states of the open shell organic cations The final chapter deals with ion beam spectroscopy This book is a valuable resource for chemists and scientists

Reactions of Ions

William Edward Marsden,1996

Ions in Solution Ronald Wilfrid Gurney,1936

Ions in Solution R. W. Gurney,1936

Gaseous Molecular Ions Eugen Illenberger,Jacques Momigny,2013-03-09 Most of the matter in our solar system and probably within the whole universe exists in the form of ionized particles On the other hand in our natural environment gaseous matter generally consists of neutral atoms and molecules Only under certain conditions such as within the path of lightning or in several technical devices e g gas discharges rocket engines etc will some of the atoms and molecules be ionized It is also believed that the chemistry of the earth's troposphere predominantly proceeds via reactions between neutral particles The complex system of atmospheric chemistry will be treated in one of the forthcoming volumes to this series Why then are ions considered so important that hundreds of laboratories all over the world including some of the most prestigious are involved in research programs on ions covering many different facets from biochemistry to physics One may obtain as many different answers as there are research groups busy in this field There is however one simple common feature which makes it attractive to work with ions since they carry one or more net elementary charges they can easily be guided focused or separated by appropriate electric and magnetic fields and last but not least they can easily be detected Apart from these advantages which are welcome and appreciated by the researcher the study of molecular ions can provide insight into very fundamental aspects of the general behavior of molecules

Large Ions Tomas Baer,Cheuk-Yiu Ng,Ivan Powis,1996 Recent advances in both experimental techniques and theoretical methodologies have meant that increasingly sophisticated studies concerning the formation structures energetics and reaction dynamics of state or energy selected molecular ions can now be performed In order to better serve the ion chemistry and physics community each volume of this series is dedicated to reviewing a specific topic emphasizing new experimental and theoretical developments in the study of ions The Wiley Series in Ion Chemistry and Physics will help stimulate new research directions and point to future opportunities in the field of ion chemistry and physics This volume the sixth in the series concentrates on the area of large ions The production detection and analysis of large ions are areas which have taken on great importance in recent years in particular in the biomedical and biochemical fields The understanding of large ions presents unique and formidable challenges which are very different from those associated with the study of small ions This volume focuses on some of the fundamental chemistry and physics associated with the behavior of large ions with the contributors addressing the issues in a quantitative fashion in order to elucidate clearly some of the key recent advances which have taken place As such Large Ions Their Vaporization Detection and Structural Analysis provides an excellent snapshot of current research in this fascinating and important area The six chapters are written by some of the leading experts in the field and together they will be of great interest to experts and newcomers both of whom will benefit from the in depth discussion of the latest methods and results

The Theory of Ions William Tibbles,1909

Cluster Ions Cheuk-Yiu Ng,Tomas Baer,Ivan Powis,1993-11-30 Cluster Ions Edited by Cheuk Yiu Ng Ames Laboratory Iowa State University Iowa USA Tomas Baer University of North Carolina NC

USA Ivan Powis University of Nottingham UK As a result of many recent advances in both experimental techniques and theoretical methodologies increasingly detailed and sophisticated studies concerning the formation structures energetics and reaction dynamics of state or energy selected molecular ions can now be performed In order better to serve the ion chemistry and physics communities each volume of this series will be dedicated to reviewing a specific topic emphasizing new experimental and theoretical developments in the study of ions This first volume is devoted to the physics and chemistry of clusters Measurement of cluster ion properties made as a function of cluster size are expected to shed some light on the basic understanding of the transition from gas phase to condensed matter The interest in cluster research is also motivated by the important roles that clusters play in many practical fields such as catalysis and microelectronics The authors of the seven chapters making up this volume are among the most active researchers in their respective areas This series will help stimulate new research directions and point to future opportunities in the field of ion chemistry **Atoms and Ions** Alfred John Cork,1969 *On the Mobilities of Ions in Air at High Pressures* John Cunningham McLennan,David Arnold Keys,1915

Ions and Ion Pairs and Their Role in Chemical Reactions International Symposium on Ions and Ion Pairs and Their Role in Chemical Reactions (1978 ; Syracuse),J Smid (ed),1979 **Handbook of Ion Sources** Bernhard Wolf,2017-07-12 The Handbook of Ion Sources delivers the data needed for daily work with ion sources It also gives information for the selection of a suitable ion source and ion production method for a specific application The Handbook concentrates on practical aspects and introduces the principle function of ion sources The basic plasma parameters are defined and discussed The working principles of various ion sources are explained and examples of each type of ion source are presented with their operational data Tables of ion current for various elements and charge states summarize the performance of different ion sources The problems related to the production of ions of non gaseous elements are detailed and data on useful materials for evaporation and ion source construction are summarized Additional chapters are dedicated to extraction and beam formation ion beam diagnosis ion source electronics and computer codes for extraction acceleration and beam transport Emittance and brilliance are described and space charge effects and neutralization discussed Various methods for the measurement of current profile emittance and time structure are presented and compared Intensity limits for these methods are provided for different ion energies Typical problems related to the operation of ion source plasmas are discussed and practical examples of circuits are given The influence of high voltage on ion source electronics and possibilities for circuit protection are covered The generation of microwaves and various microwave equipment are described and special problems related to microwave operation are summarized The Handbook of Ion Sources is a valuable reference on the subject of benefit to practitioners and graduate students interested in accelerators ion implantation and ion beam techniques **Complex Ions in Aqueous Solutions** Arthur Jaques,1914 *On the Mobilities of Ions in Air at High Pressures* John Cunningham MacLennan,David Arnold Keys,1915 **Single-Ion Solvation** Philippe Hunenberger,Maria Reif,2015-10-20 Ions are

ubiquitous in chemical technological ecological and biological processes Characterizing their role in these processes in the first place requires the evaluation of the thermodynamic parameters associated with the solvation of a given ion However due to the constraint of electroneutrality the involvement of surface effects and the ambiguous connection between microscopic and macroscopic descriptions the determination of single ion solvation properties via both experimental and theoretical approaches has turned out to be a very difficult and highly controversial problem This unique book provides an up to date compact and consistent account of the research field of single ion solvation thermodynamics that has over one hundred years of history and still remains largely unsolved By reviewing the various approaches employed to date establishing the relevant connections between single ion thermodynamics and electrochemistry resolving conceptual ambiguities and giving an exhaustive data compilation in the context of alkali and halide hydration this book provides a consistent synthesis in depth understanding and clarification of a large and sometimes very confusing research field The book is primarily aimed at researchers professors postgraduates graduates and industrial researchers concerned with processes involving ionic solvation properties these are ubiquitous eg in physical organic analytical chemistry electrochemistry biochemistry pharmacology geology and ecology Because of the concept definitions and data compilations it contains it is also a useful reference book to have in a university library Finally it may be of general interest to anyone wanting to learn more about ions and solvation Key features discusses both experimental and theoretical approaches and establishes the connection between them provides both an account of the past research covering over one hundred years and a discussion of current directions in particular on the theoretical side involves a comprehensive reference list of over 2000 citations employs a very consistent notation including table of symbols and unambiguous definitions of all introduced quantities provides a discussion and clarification of ambiguous concepts ie concepts that have not been defined clearly or have been defined differently by different authors leading to confusion in past literature encompasses an exhaustive data compilation in the restricted context of alkali and halide hydration along with recommended values after critical analysis of this literature data is illustrated by a number of synoptic colour figures that will help the reader to grasp the connections between different concepts in one single picture

Trapping Highly Charged Ions John Gillaspy,2001 This book provides an elementary introduction to the field of trapping highly charged ions The first group of chapters is intended to describe the various sorts of highly charged ion traps EBIT EBIS ECR Storage Rings and various speciality traps The authors focus on their own ion trap facilities in order to teach by example The chapters range in scope from comprehensive reviews to brief introductions The second group of chapters is intended to give a flavour of the various sorts of scientific research which are presently being carried out with traps for highly charged ions These chapters not only inform but also stimulate newcomers to think up fresh ideas The articles in this second group generally fall into one of three broad categories atomic structure experiments ion surface interactions and precision mass spectrometry The third group of chapters is intended to deal with theory and spectroscopic

analysis It provides some of the background material necessary to make sense of observed phenomenology to allow detailed explanation of experimental data and to sensibly plan further experimentation An appendix provides a complete keyword annotated bibliography of pa **Ions in Solution (1) (sound Recording).** John Burgess, 1984

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