



# Chapter 4 & 5: Modern Model of the Atom and Bonding

Supplemental Instruction  
Iowa State University

Leader:	Katie
Course:	Chem 163
Instructor:	Burnett/Kingston
Date:	September 28, 2009

## Review

- What is the noble gas configuration of the following atoms and ions?
  - Ar  $[\text{Ne}] 3s^2 3p^4$  or  $[\text{Ar}]$
  - $\text{Na}^+$   $[\text{Ne}] 2s^2 2p^6$  or  $[\text{Ne}]$
  - $\text{C}^{2-}$   $[\text{He}] 2s^2 2p^4$
  - $\text{O}^{2-}$   $[\text{He}] 2s^2 2p^6$  or  $[\text{Ne}]$
  - $\text{Ca}^{2+}$   $[\text{Ar}] 3s^2 3p^6$  or  $[\text{Ar}]$

## New Material

- Define the following terms and answer associated questions.
  - Heisenberg uncertainty principle:** Principle that states that the position and momentum of a subatomic particle cannot be known simultaneously.
    - orbital:** 3D volume in space, cloud like distribution of electrons.
      - What is its maximum capacity?  $2e^-$
    - covalent bond:** Chemical bond where the electrons are shared.
      - What does it represent? The covalent bond represents an energy minimum.
      - Is energy absorbed or released when a covalent bond is formed? Energy is released.
    - bond length:**
      - What causes bond length? The attraction of electrons to the nuclei and repulsion of 2 nuclei.
      - What units is bond length measured in?  $\text{\AA} = \text{Angstrom} = 10^{-10} \text{ m} = 1 \text{ nm}$
  - How many orbitals are there in any s sublevel? Any p sublevel? Any d sublevel?
    - s = 1 orbital -  $2e^-$
    - p = 3 orbitals -  $6e^-$
    - d = 5 orbitals -  $10e^-$
  - Draw the orbitals for the  $2p^5$ . How many electrons are there in each orbital?



- Write the following atoms in Lewis Dot notation.
  - N  $\text{N}^\bullet$
  - H  $\text{H}^\bullet$
  - Xe  $\text{Xe}^\bullet$
  - Fe  $\text{Fe}^\bullet$

## Supplemental Instruction

# Modern Chemistry Chapter 12 3 Review Answers

**Eugene Meyer**



## **Modern Chemistry Chapter 12 3 Review Answers:**

*Modern Chemistry* Holt Rinehart & Winston, Holt, Rinehart and Winston Staff, 2001      **Independent and Weekly Review**, 1914      *Instructor's Manual and Test Bank to Accompany Basic Concepts of Chemistry* Malone, 2000-04-18

**Principles of Modern Chemistry** David W. Oxtoby, H. Pat Gillis, Laurie J. Butler, 2016-01-01 Long considered the standard for honors and high level mainstream general chemistry courses **PRINCIPLES OF MODERN CHEMISTRY** continues to set the standard as the most modern rigorous and chemically and mathematically accurate text on the market This authoritative text features an atoms first approach and thoroughly revised chapters on Quantum Mechanics and Molecular Structure Chapter 6 Electrochemistry Chapter 17 and Molecular Spectroscopy and Photochemistry Chapter 20 In addition the text utilizes mathematically accurate and artistic atomic and molecular orbital art and is student friendly without compromising its rigor End of chapter study aids focus on only the most important key objectives equations and concepts making it easier for students to locate chapter content while applications to a wide range of disciplines such as biology chemical engineering biochemistry and medicine deepen students understanding of the relevance of chemistry beyond the classroom      *Solutions Guide for Introductory Chemistry* James F. Hall, 1996      **Foundations of College Chemistry, Student Solutions Manual** Morris Hein, Susan Arena, Cary Willard, 2022-03-09 Check your work and better retain the lessons of *Foundations of College Chemistry* The *Foundations of College Chemistry* 16th Edition Student Solutions Manual is an essential study resource and aid that allows users of the widely read text to check their work against the detailed solutions contained in this book This Solutions Manual unlocks the full value of the practice problem and exercise focused 16th edition of *Foundations of College Chemistry* Students will be able to study efficiently and effectively and learn from common errors with the additional guidance offered by this book      **Lab Experiments Modern Chemistry** Harold Clark Metcalfe, 1982

**Arithmetic, a Modern Approach** Mervin Laverne Keedy, Marvin Lowell Bittinger, 1975      **Modern Electrochemistry 2B** John O'M. Bockris, Amulya K.N. Reddy, 2007-05-08 This book had its nucleus in some lectures given by one of us J O M B in a course on electrochemistry to students of energy conversion at the University of Pennsylvania It was there that he met a number of people trained in chemistry physics biology metallurgy and materials science all of whom wanted to know something about electrochemistry The concept of writing a book about electrochemistry which could be understood by people with very varied backgrounds was thereby engendered The lectures were recorded and written up by Dr Klaus Muller as a 293 page manuscript At a later stage A K N R joined the effort it was decided to make a fresh start and to write a much more comprehensive text Of methods for direct energy conversion the electrochemical one is the most advanced and seems the most likely to become of considerable practical importance Thus conversion to electrochemically powered transportation systems appears to be an important step by means of which the difficulties of air pollution and the effects of an increasing concentration in the atmosphere of carbon dioxide may be met Corrosion is recognized as having an electrochemical basis The

synthesis of nylon now contains an important electrochemical stage Some central biological mechanisms have been shown to take place by means of electrochemical reactions A number of American organizations have recently recommended greatly increased activity in training and research in electrochemistry at universities in the United States **Merrill Chemistry**

Robert C. Smoot, Smoot, Richard G. Smith, Jack Price, 1998

**Introduction to Modern Chemistry: Student Manual**

Eugene Meyer, 1979

**Basics for Chemistry** David A. Ucko, 2013-09-24

Basics of Chemistry provides the tools needed in the study of General Chemistry such as problem solving skills calculation methods and the language and basic concepts of chemistry The book is designed to meet the specific needs of underprepared students Concepts are presented only as they are needed and developed from the simple to the complex The text is divided into 18 chapters each covering some particular aspect of chemistry such as matter energy and measurement the properties of atoms description of chemical bonding study of chemical change and nuclear and organic chemistry Undergraduate students will find the book as a very valuable academic material

**Solutions Guide, Introductory Chemistry, a Foundation, Introductory Chemistry, Basic Chemistry, Fourth Edition, Zumdahl** James F. Hall, 2000

Problems and Problem Solving in Chemistry Education

Georgios Tsaparis, 2021-05-17 Problem solving is central to the teaching and learning of chemistry at secondary tertiary and post tertiary levels of education opening to students and professional chemists alike a whole new world for analysing data looking for patterns and making deductions As an important higher order thinking skill problem solving also constitutes a major research field in science education Relevant education research is an ongoing process with recent developments occurring not only in the area of quantitative computational problems but also in qualitative problem solving The following situations are considered some general others with a focus on specific areas of chemistry quantitative problems qualitative reasoning metacognition and resource activation deconstructing the problem solving process an overview of the working memory hypothesis reasoning with the electron pushing formalism scaffolding organic synthesis skills spectroscopy for structural characterization in organic chemistry enzyme kinetics problem solving in the academic chemistry laboratory chemistry problem solving in context team based active learning technology for molecular representations IR spectra simulation and computational quantum chemistry tools The book concludes with methodological and epistemological issues in problem solving research and other perspectives in problem solving in chemistry With a foreword by George Bodner

Molecular Chemistry and Biomolecular Engineering Lionello Pogliani, Francisco Torrens, A. K. Haghi, 2019-09-30 This new volume is devoted to molecular chemistry and its applications to the fields of biology It looks at the integration of molecular chemistry with biomolecular engineering with the goal of creating new biological or physical properties to address scientific or societal challenges It takes a both multidisciplinary and interdisciplinary perspective on the interface between molecular biology biophysical chemistry and chemical engineering Molecular Chemistry and Biomolecular Engineering Integrating Theory and Research with Practice provides effective support for the development of the laboratory and data analysis skills

that researchers will draw on time and again for the practical aspects and also gives a solid grounding in the broader transferable skills

*Introduction to Thermal Analysis* M.E. Brown, 2012-12-06 The aim of this book is as its title suggests to help someone with little or no knowledge of what thermal analysis can do to find out briefly what the subject is all about to decide whether it will be of use to him or her and to help in getting started on the more common techniques Some of the less common techniques are mentioned but more specialized texts should be consulted before venturing into these areas This book arose out of a set of notes prepared for courses on thermal analysis given at instrument workshops organized by the S A Chemical Institute It has also been useful for similar short courses given at various universities and technicians I have made extensive use of the manufacturers literature and I am grateful to them for this information A wide variety of applications has been drawn from the literature to use as examples and these are acknowledged in the text A fuller list of the books reviews and other literature of thermal analysis is given towards the back of this book The ICTA booklet For Better Thermal Analysis is also a valuable source of information I am particularly grateful to my wife Cindy for typing the manuscript to Mrs Heather Wilson for the line drawings and to Professor David Dollimore of the University of Toledo Ohio for many helpful suggestions

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*Chemical kinetics* Elena Burlakova, Alexander Evgen'evich Shilov, Sergey Dmitrievich Varfolomeev, Gennady Zaikov, 2005-10-28 The volume is devoted to the problem of chemical kinetics on modern level The book includes information on chemical physics of nanocomposites degradation stabilization and flammability of polymeric materials as well as free radical mechanism of oxidation of organic compounds thermostability mechanism of action of catalytical systems and inhibi

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