

## Chapter 6 Review Chemical Bonding

A unique overview of the different kinds of chemical bonds that can be found in the periodic table, from the main-group elements to transition elements, lanthanides and actinides. It takes into account the many developments that have taken place in the field over the past few decades due to the rapid advances in quantum chemical models and faster computers. This is the perfect complement to "Chemical Bonding - Fundamentals and Models" by the same editors, who are two of the top scientists working on this topic, each with extensive experience and important connections within the community.

Devoted to a diverse group of solid state scientists, the book has two objectives, both relating to structural chemistry: (i) a progressive analytic familiarization with the main parameters that govern the organization of crystallized matter and related crystal structures, (ii) a study of what are the various ways to 'read' a structure far beyond its representation in scientific articles. Hence, the reader will, from numerous examples illustrated in color, analyze what are the main characteristics of these structures, from their geometric characteristics, their coordination polyhedra, their connections with the resulting dimensionalities of these solids, including also the defects they exhibit, before looking at possibilities to classify structures, within which recurrence laws can emerge. Chemists are required to understand the potentials of a new structure for becoming future materials scientists. The first part of the book is by no means a database for known structures, but facilitates a progressive understanding of the organization of the solid state. With these tools in hand, the reader is invited in the later part of the book to analyze new structures, and to also use new concepts for viewing structures in a more synthetic way for the future. Such new vision is already leading to the creation of completely new solids with outstanding characteristics that find applications in societal problems concerning energy, energy savings, environment and health. The content is not exclusively academic but relates to the creation of innovative materials, through a more physical approach, that might condition the future of materials.

Adapted from Nivaldo J. Tro's best-selling general chemistry book, Principles of Chemistry: A Molecular Approach focuses exclusively on the core concepts of general chemistry without sacrificing depth or relevance. Tro's unprecedented two- and three-column problem-solving approach is used throughout to give students sufficient practice in this fundamental skill. A unique integration of macroscopic, molecular, and symbolic illustrations helps students to visualize the various dimensions of chemistry; Tro's engaging writing style captures student's attention with relevant applications. The Second Edition offers a wealth of new and revised problems, approximately 50 new conceptual connections, an updated art program throughout, and is available with MasteringChemistry®, the most advanced online tutorial and assessment program available. This package contains: Principles of Chemistry: A Molecular Approach, Second Edition

Chemistry at Extreme Conditions covers those chemical processes that occur in the pressure regime of 0.5–200 GPa and temperature range of 500–5000 K and includes such varied phenomena as comet collisions, synthesis of super-hard materials, detonation and combustion of energetic materials, and organic conversions in the interior of planets. The book provides an insight into this active and exciting field of research. Written by top researchers in the field, the book covers state of the art experimental advances in high-pressure technology, from shock physics to laser-heating techniques to study the nature of the chemical bond in transient processes. The chapters have been conventionally organised into four broad themes of applications: biological and bioinorganic systems; Experimental works on the transformations in small molecular systems; Theoretical methods and computational modeling of shock-compressed materials; and experimental and computational approaches in energetic materials research. \* Extremely practical book containing up-to-date research in high-pressure science \* Includes chapters on recent advances in computer modelling \* Review articles can be used as reference guide

The Eighth Edition of Zumdahl and DeCoste's best-selling INTRODUCTORY CHEMISTRY: A FOUNDATION that combines enhanced problem-solving structure with substantial pedagogy to enable students to become strong independent problem solvers in the introductory course and beyond. Capturing student interest through early coverage of chemical reactions, accessible explanations and visualizations, and an emphasis on everyday applications, the authors explain chemical concepts by starting with the basics, using symbols or diagrams, and conclude by encouraging students to test their own understanding of the solution. This step-by-step approach has already helped hundreds of thousands of students master chemical concepts and develop problem-solving skills. The book is known for its focus on conceptual learning and for the way it motivates students by connecting chemical principles to real-life experiences in chapter-opening discussions and Chemistry in Focus boxes. The Seventh Edition now adds a questioning pedagogy to in-text examples to help students learn what questions they should be asking themselves while solving problems, offers a revamped art program to better serve visual learners, and includes a significant number of revised end-of-chapter questions. The book's unsurpassed teaching and learning resources include a robust technology package that now offers a choice between OWL: Online Web Learning and Enhanced WebAssign. Important Notice: Media content referenced within the product description or the product text may not be available in the ebook version.

Organic Chemistry Concepts and Applications for Medicinal Chemistry provides a valuable refresher for understanding the relationship between chemical bonding and those molecular properties that help to determine medicinal activity. This book explores the basic aspects of structural organic chemistry without going into the various classes of reactions. Two medicinal chemistry concepts are also introduced: partition coefficients and the nomenclature of cyclic and polycyclic ring systems that comprise a large number of drug molecules. Given the systematic name of a drug, the reader is guided through the process of drawing an accurate chemical structure. By emphasizing the relationship

between structure and properties, this book gives readers the connections to more fully comprehend, retain, apply, and build upon their organic chemistry background in further chemistry study, practice, and exams. Focused approach to review those organic chemistry concepts that are most important for medicinal chemistry practice and understanding. Accessible content to refresh the reader's knowledge of bonding, structure, functional groups, stereochemistry, and more. Appropriate level of coverage for students in organic chemistry, medicinal chemistry, and related areas; individuals seeking content review for graduate and medical courses and exams; pharmaceutical patent attorneys; and chemists and scientists requiring a review of pertinent material.

New technologies are made possible by new materials, and until recently new materials could only be discovered experimentally. Recent advances in solving the crystal structure prediction problem means that the computational design of materials is now a reality. Computational Materials Discovery provides a comprehensive review of this field covering different computational methodologies as well as specific applications of materials design. The book starts by illustrating how and why first-principle calculations have gained importance in the process of materials discovery. The book is then split into three sections, the first exploring different approaches and ideas including crystal structure prediction from evolutionary approaches, data mining methods and applications of machine learning. Section two then looks at examples of designing specific functional materials with special technological relevance for example photovoltaic materials, superconducting materials, topological insulators and thermoelectric materials. The final section considers recent developments in creating low-dimensional materials. With contributions from pioneers and leaders in the field, this unique and timely book provides a convenient entry point for graduate students, researchers and industrial scientists on both the methodologies and applications of the computational design of materials.

Authoritative reference features extensive coverage of structural information as well as theory and applications. Helpful data on molecular geometries, bond lengths, and bond angles in tables and other graphics. 1991 edition.

Molecular surface science has made enormous progress in the past 30 years. The development can be characterized by a revolution in fundamental knowledge obtained from simple model systems and by an explosion in the number of experimental techniques. The last 10 years has seen an equally rapid development of quantum mechanical modeling of surface processes using Density Functional Theory (DFT). Chemical Bonding at Surfaces and Interfaces focuses on phenomena and concepts rather than on experimental or theoretical techniques. The aim is to provide the common basis for describing the interaction of atoms and molecules with surfaces and this to be used very broadly in science and technology. The book begins with an overview of structural information on surface adsorbates and discusses the structure of a number of important chemisorption systems. Chapter 2 describes in detail the chemical bond between atoms or molecules and a metal surface in the observed surface structures. A detailed description of experimental information on the dynamics of bond-formation and bond-breaking at surfaces make up Chapter 3. Followed by an in-depth analysis of aspects of heterogeneous catalysis based on the d-band model. In Chapter 5 adsorption and chemistry on the enormously important Si and Ge semiconductor surfaces are covered. In the remaining two Chapters the book moves on from solid-gas interfaces and looks at solid-liquid interface processes. In the final chapter an overview is given of the environmentally important chemical processes occurring on mineral and oxide surfaces in contact with water and electrolytes. Gives examples of how modern theoretical DFT techniques can be used to design heterogeneous catalysts. This book suits the rapid introduction of methods and concepts from surface science into a broad range of scientific disciplines where the interaction between a solid and the surrounding gas or liquid phase is an essential component. Shows how insight into chemical bonding at surfaces can be applied to a range of scientific problems in heterogeneous catalysis, electrochemistry, environmental science and semiconductor processing. Provides both the fundamental perspective and an overview of chemical bonding in terms of structure, electronic structure and dynamics of bond rearrangements at surfaces.

General Chemistry for Engineers explores the key areas of chemistry needed for engineers. This book develops material from the basics to more advanced areas in a systematic fashion. As the material is presented, case studies relevant to engineering are included that demonstrate the strong link between chemistry and the various areas of engineering. Serves as a unique chemistry reference source for professional engineers. Provides the chemistry principles required by various engineering disciplines. Begins with an 'atoms first' approach, building from the simple to the more complex chemical concepts. Includes engineering case studies connecting chemical principles to solving actual engineering problems. Links chemistry to contemporary issues related to the interface between chemistry and engineering practices.

There are more than 20 million chemicals in the literature, with new materials being synthesized each week. Most of these molecules are stable, and the 3-dimensional arrangement of the atoms in the molecules, in the various solids may be determined by routine x-ray crystallography. When this is done, it is found that this vast range of molecules, with varying sizes and shapes can be accommodated by only a handful of solid structures. This limited number of architectures for the packing of molecules of all shapes and sizes, to maximize attractive intermolecular forces and minimizing repulsive intermolecular forces, allows us to develop simple models of what holds the molecules together in the solid. In this volume we look at the origin of the molecular architecture of crystals; a topic that is becoming increasingly important and is often termed, crystal engineering. Such studies are a means of predicting crystal structures, and of designing crystals with particular properties by manipulating the structure and interaction of large molecules. That is, creating new crystal architectures with desired physical characteristics in which the molecules pack together in particular architectures; a subject of particular interest to the pharmaceutical industry.

College Chemistry Multiple Choice Questions and Answers (MCQs): Quizzes & Practice Tests with Answer Key PDF, College Chemistry Worksheets & Quick Study Guide

covers exam review worksheets to solve problems with 1400 solved MCQs. "College Chemistry MCQ" PDF with answers covers concepts, theory and analytical assessment tests. "College Chemistry Quiz" PDF book helps to practice test questions from exam prep notes. Chemistry study guide provides 1400 verbal, quantitative, and analytical reasoning solved past question papers MCQs. College Chemistry Multiple Choice Questions and Answers PDF download, a book covers solved quiz questions and answers on chapters: atomic structure, basic chemistry, chemical bonding: chemistry, experimental techniques, gases, liquids and solids worksheets for college and university revision guide. "College Chemistry Quiz Questions and Answers" PDF download with free sample test covers beginner's questions and mock tests with exam workbook answer key. College chemistry MCQs book, a quick study guide from textbooks and lecture notes provides exam practice tests. "College Chemistry Worksheets" PDF book with answers covers problem solving in self-assessment workbook from chemistry textbooks with past papers worksheets as: Worksheet 1: Atomic Structure MCQs Worksheet 2: Basic Chemistry MCQs Worksheet 3: Chemical Bonding MCQs Worksheet 4: Experimental Techniques MCQs Worksheet 5: Gases MCQs Worksheet 6: Liquids and Solids MCQs Practice test Atomic Structure MCQ PDF with answers to solve MCQ questions: Atoms, atomic spectrum, atomic absorption spectrum, atomic emission spectrum, molecules, azimuthal quantum number, Bohr's model, Bohr's atomic model defects, charge to mass ratio of electron, discovery of electron, discovery of neutron, discovery of proton, dual nature of matter, electron charge, electron distribution, electron radius and energy derivation, electron velocity, electronic configuration of elements, energy of revolving electron, fundamental particles, Heisenberg's uncertainty principle, hydrogen spectrum, magnetic quantum number, mass of electron, metallic crystals properties, Moseley law, neutron properties, orbital concept, photons wave number, Planck's quantum theory, properties of cathode rays, properties of positive rays, quantum numbers, quantum theory, Rutherford model of atom, shapes of orbitals, spin quantum number, what is spectrum, x rays, and atomic number. Practice test Basic Chemistry MCQ PDF with answers to solve MCQ questions: Basic chemistry, atomic mass, atoms, molecules, Avogadro's law, combustion analysis, empirical formula, isotopes, mass spectrometer, molar volume, molecular ions, moles, positive and negative ions, relative abundance, spectrometer, and stoichiometry. Practice test Chemical Bonding MCQ PDF with answers to solve MCQ questions: Chemical bonding, chemical combinations, atomic radii, atomic radius periodic table, atomic, ionic and covalent radii, atoms and molecules, bond formation, covalent radius, electron affinity, electronegativity, electronegativity periodic table, higher ionization energies, ionic radius, ionization energies, ionization energy periodic table, Lewis concept, and modern periodic table. Practice test Experimental Techniques MCQ PDF with answers to solve MCQ questions: Experimental techniques, chromatography, crystallization, filter paper filtration, filtration crucibles, solvent extraction, and sublimation. Practice test Gases MCQ PDF with answers to solve MCQ questions: Gas laws, gas properties, kinetic molecular theory of gases, ideal gas constant, ideal gas density, liquefaction of gases, absolute zero derivation, applications of Daltons law, Avogadro's law, Boyle's law, Charles law, Daltons law, diffusion and effusion, Graham's law of diffusion, ideality deviations, kinetic interpretation of temperature, liquids properties, non-ideal behavior of gases, partial pressure calculations, plasma state, pressure units, solid's properties, states of matter, thermometry scales, and van der Waals equation. Practice test Liquids and Solids MCQ PDF with answers to solve MCQ questions: Liquid crystals, types of solids, classification of solids, comparison in solids, covalent solids, properties of crystalline solids, Avogadro number determination, boiling point, external pressure, boiling points, crystal lattice, crystals and classification, cubic close packing, diamond structure, dipole-dipole forces, dipole induced dipole forces, dynamic equilibrium, energy changes, intermolecular attractions, hexagonal close packing, hydrogen bonding, intermolecular forces, London dispersion forces, metallic crystals properties, metallic solids, metal's structure, molecular solids, phase changes energies, properties of covalent crystals, solid iodine structure, unit cell, and vapor pressure.

This book explores chemical bonds, their intrinsic energies, and the corresponding dissociation energies which are relevant in reactivity problems. It offers the first book on conceptual quantum chemistry, a key area for understanding chemical principles and predicting chemical properties. It presents NBO mathematical algorithms embedded in a well-tested and widely used computer program (currently, NBO 5.9). While encouraging a "look under the hood" (Appendix A), this book mainly enables students to gain proficiency in using the NBO program to re-express complex wavefunctions in terms of intuitive chemical concepts and orbital imagery.

Most people remember chemistry from their schooldays as largely incomprehensible, a subject that was fact-rich but understanding-poor, smelly, and so far removed from the real world of events and pleasures that there seemed little point, except for the most introverted, in coming to terms with its grubby concepts, spells, recipes, and rules. Peter Atkins wants to change all that. In this Very Short Introduction to Chemistry, he encourages us to look at chemistry anew, through a chemist's eyes, in order to understand its central concepts and to see how it contributes not only towards our material comfort, but also to human culture. Atkins shows how chemistry provides the infrastructure of our world, through the chemical industry, the fuels of heating, power generation, and transport, as well as the fabrics of our clothing and furnishings. By considering the remarkable achievements that chemistry has made, and examining its place between both physics and biology, Atkins presents a fascinating, clear, and rigorous exploration of the world of chemistry - its structure, core concepts, and exciting contributions to new cutting-edge technologies. ABOUT THE SERIES: The Very Short Introductions series from Oxford University Press contains hundreds of titles in almost every subject area. These pocket-sized books are the perfect way to get ahead in a new subject quickly. Our expert authors combine facts, analysis, perspective, new ideas, and enthusiasm to make interesting and challenging topics highly readable.

Introducing astrochemistry to a wide audience, this book describes how molecules formed in chemical reactions occur in a range of environments in interstellar and circumstellar space, from shortly after the Big Bang up to the present epoch. Stressing that chemistry in these environments needs to be driven, it helps identify these drivers and the various chemical networks that operate giving rise to signature molecules that enable the physics of the region to be better understood. The book emphasises, in a non-mathematical way, the chemistry of the Milky Way Galaxy and its planet-forming regions, describes how other galaxies may have rather different chemistries and shows how chemistry was important even in the Early Universe when most of the elements had yet to be formed. This book will appeal to anyone with a general interest in chemistry, from students to professional scientists working in interdisciplinary areas and non-scientists fascinated by the evolving and exciting story of chemistry in the cosmos.

Now updated—the current state of development of modern surface science Since the publication of the first edition of this book, molecular surface chemistry and catalysis science have developed rapidly and expanded into fields where atomic scale and molecular information were previously not available. This revised edition of *Introduction to Surface Chemistry and Catalysis* reflects this increase of information in virtually every chapter. It emphasizes the modern concepts of surface chemistry and catalysis uncovered by breakthroughs in molecular-level studies of surfaces over the past three decades while serving as a reference source for data and concepts related to properties of surfaces and interfaces. The book opens with a brief history of the evolution of surface chemistry and reviews the nature of various surfaces and interfaces encountered in everyday life. New research in two crucial areas—nanomaterials and polymer and biopolymer interfaces—is emphasized, while important applications in tribology and catalysis, producing chemicals and fuels with high turnover and selectivity, are addressed. The basic concepts surrounding various properties of surfaces such as structure, thermodynamics, dynamics, electrical properties, and surface chemical bonds are presented. The techniques of atomic and molecular scale studies of surfaces are listed with references to up-to-date review papers. For advanced readers, this book covers recent developments in in-situ surface analysis such as high-pressure scanning tunneling microscopy, ambient pressure X-ray photoelectron spectroscopy, and sum frequency generation vibrational spectroscopy (SFG). Tables listing surface structures and data summarizing the kinetics of catalytic reactions over metal surfaces are also included. New to this edition: A discussion of new physical and chemical properties of nanoparticles Ways to utilize new surface science techniques to study properties of polymers, reaction intermediates, and mobility of atoms and molecules at surfaces Molecular-level studies on the origin of the selectivity for several catalytic reactions A microscopic understanding of mechanical properties of surfaces Updated tables of experimental data A new chapter on "soft" surfaces, polymers, and biointerfaces *Introduction to Surface Chemistry and Catalysis* serves as a textbook for undergraduate and graduate students taking advanced courses in physics, chemistry, engineering, and materials science, as well as researchers in surface science, catalysis science, and their applications.

Our high school chemistry program has been redesigned and updated to give your students the right balance of concepts and applications in a program that provides more active learning, more real-world connections, and more engaging content. A revised and enhanced text, designed especially for high school, helps students actively develop and apply their understanding of chemical concepts. Hands-on labs and activities emphasize cutting-edge applications and help students connect concepts to the real world. A new, captivating design, clear writing style, and innovative technology resources support your students in getting the most out of their textbook. - Publisher.

Chemical education is essential to everybody because it deals with ideas that play major roles in personal, social, and economic decisions. This book is based on three principles: that all aspects of chemical education should be associated with research; that the development of opportunities for chemical education should be both a continuous process and be linked to research; and that the professional development of all those associated with chemical education should make extensive and diverse use of that research. It is intended for: pre-service and practising chemistry teachers and lecturers; chemistry teacher educators; chemical education researchers; the designers and managers of formal chemical curricula; informal chemical educators; authors of textbooks and curriculum support materials; practising chemists and chemical technologists. It addresses: the relation between chemistry and chemical education; curricula for chemical education; teaching and learning about chemical compounds and chemical change; the development of teachers; the development of chemical education as a field of enquiry. This is mainly done in respect of the full range of formal education contexts (schools, universities, vocational colleges) but also in respect of informal education contexts (books, science centres and museums).

The first modernized overview of chemical valency and bonding theory, based on current computational technology.

*Understanding the Basics of QSAR for Applications in Pharmaceutical Sciences and Risk Assessment* describes the historical evolution of quantitative structure-activity relationship (QSAR) approaches and their fundamental principles. This book includes clear, introductory coverage of the statistical methods applied in QSAR and new QSAR techniques, such as HQSAR and G-QSAR. Containing real-world examples that illustrate important methodologies, this book identifies QSAR as a valuable tool for many different applications, including drug discovery, predictive toxicology and risk assessment. Written in a straightforward and engaging manner, this is the ideal resource for all those looking for general and practical knowledge of QSAR methods.

Includes numerous practical examples related to QSAR methods and applications Follows the Organization for Economic Co-operation and Development principles for QSAR model development Discusses related techniques such as structure-based design and the combination of structure- and ligand-based design tools

'... there has long been a need for a dedicated monograph on the subject... a highly readable book about a theory that, though it has long found application in inorganic crystal chemistry, deserves to be used more widely.' *Crystallography News*The bond valence model is a recently developed model of the chemical bond in inorganic chemistry that complements the bond model widely used in organic chemistry. It is simple, quantitative, intuitive, and predictive - no more than a pocket calculator is needed to calculate it. This book focuses on the theory that underlies the model, and shows how it has been used in physics, materials science, chemistry, mineralogy, soil science, and molecular biology.

*Introduction to Chemistry* is a 26-chapter introductory textbook in general chemistry. This book deals first with the atoms and the arithmetic and energetics of their combination into molecules. The subsequent chapters consider the nature of the interactions among atoms or the so-called chemical bonding. This topic is followed by discussions on the nature of intermolecular forces and the states of matter. This text further explores the statistics and dynamics of chemistry, including the study of equilibrium and kinetics. Other chapters cover the aspects of ionic equilibrium, acids and bases, and galvanic cells. The concluding chapters focus on a descriptive study of chemistry, such as the representative and transition elements, organic and nuclear chemistry, metals, polymers, and biochemistry. Teachers and undergraduate chemistry students will find this book of great value.

The VSEPR Model of Molecular Geometry Courier Corporation

Essential strategies, practice, and review to ace the SAT Subject Test Chemistry. Getting into a top college has never been more difficult. Students need to distinguish themselves from the crowd, and scoring well on a SAT Subject Test gives students a competitive edge. Kaplan's SAT Subject Test: Chemistry is the most up-to-date guide on the market with complete coverage of both the content review and strategies students need for success on test day. Kaplan's SAT Subject Test: Chemistry features: \* A full-length diagnostic test \* Full-length practice tests \* Focused chapter summaries, highlights, and quizzes \* Detailed answer explanations \* Proven score-raising strategies \* End-of-chapter quizzes Kaplan is serious about raising students' scores—we guarantee students will get a higher score.

A readable little book assisting the student in understanding, in a nonmathematical way, the essentials of the different bonds occurring in chemistry. Starting with a short, self-contained introduction, Chapter 1 presents the essential elements of the variation approach to either total or second-order molecular energies, the system of atomic units (au) necessary to

simplify all mathematical expressions, and an introductory description of the electron distribution in molecules. Using mostly 2x2 Hückel secular equations, Chapter 2, by far the largest part of the book because of the many implications of the chemical bond, introduces a model of bonding in homonuclear and heteronuclear diatomics, multiple and delocalized bonds in hydrocarbons, and the stereochemistry of chemical bonds in polyatomic molecules, in a word, a model of the strong first-order interactions originating the chemical bond. In Chapter 3 the Hückel model of the linear polyene chain is used to explain the origin of band structure in the 1-dimensional crystal. Chapter 4 deals with a simple two-state model of weak interactions, introducing the reader to understand second-order electric properties of molecules and VdW bonding between closed shells. Lastly, Chapter 5 studies the structure of H-bonded dimers and the nature of the hydrogen bond, which has a strength intermediate between a VdW bond and a weak chemical bond. Besides a qualitative MO approach based on HOMO-LUMO charge transfer from an electron donor to an electron acceptor molecule, a quantitative electrostatic approach is presented yielding an electrostatic model working even at its simplest pictorial level. A list of alphabetically ordered references, author and subject indices complete the book.

The thoroughly revised & updated 2nd edition of the book on Chemical Bonding is designed especially in accordance with latest competitive trends. The book has been updated with the past questions of NEET, JEE Main & JEE Advanced. A new chapter entitled 'Hydrolysis of Covalent Compounds' has been added based on student's high demand. The salient features of the book are as follows: \* A moderately concise and compact book covering all topics from A –Z. \* Bent Rule with latest amendments and Drago's Rule \* Physical properties of ionic & covalent compounds with detailed explanation. \* Increasing and decreasing order of lattice energy, hydration energy, polarization and effect of these on physical properties has been done comparatively. \* Simple language to make it useful even to average and weak students. \* Logical and evolutionary approach in descriptions for better imagination and visualization. \* Large no. of solved examples, illustrations and Objective type questions. \* Miscellaneous Practice Problems as final challenge.

Polar Covalence provides a detailed account of a successful approach to understanding chemistry from knowledge of atomic structure and the properties that result from this structure. This book discusses the nature of multiple bonds. Organized into 16 chapters, this book begins with an overview of the interrelationships of various basic atomic properties. This text then describes chemical bonding, which can only occur when the nuclei of both atoms can attract the same electrons. Other chapters consider the bond energy of multiple bonds, which can be determined by calculating the energy in the usual way as though the bonds were single but of the experimental length. This book discusses as well the reduction of the lone pair bond weakening effect through the formation of multiple bonds. The final chapter deals with the relative roles of principles and practice in the teaching of inorganic and general chemistry. This book is a valuable resource for chemists and students.

Chemistry is a conceptual subject and, in order to explain many of the concepts, teachers use models to describe the microscopic world and relate it to the macroscopic properties of matter. This can lead to problems, as a student's every-day experiences of the world and use of language can contradict the ideas put forward in chemical science. These titles have been designed to help tackle this issue of misconceptions. Part 1 deals with the theory, by including information on some of the key alternative conceptions that have been uncovered by research; ideas about a variety of teaching approaches that may prevent students acquiring some common alternative conceptions; and general ideas for assisting students with the development of appropriate scientific conceptions. Part 2 provides strategies for dealing with some of the misconceptions that students have, by including ready to use classroom resources including copies of probes that can be used to identify ideas held by students; some specific exercises aimed at challenging some of the alternative ideas; and classroom activities that will help students to construct the chemical concepts required by the curriculum. Used together, these two books will provide a good theoretical underpinning of the fundamentals of chemistry. Trialled in schools throughout the UK, they are suitable for teaching ages 11-18.

The authors, who have more than two decades of combined experience teaching an atoms-first course, have gone beyond reorganizing the topics. They emphasize the particulate nature of matter throughout the book in the text, art, and problems, while placing the chemistry in a biological, environmental, or geological context. The authors use a consistent problem-solving model and provide students with ample opportunities to practice.

Biology for AP® courses covers the scope and sequence requirements of a typical two-semester Advanced Placement® biology course. The text provides comprehensive coverage of foundational research and core biology concepts through an evolutionary lens. Biology for AP® Courses was designed to meet and exceed the requirements of the College Board's AP® Biology framework while allowing significant flexibility for instructors. Each section of the book includes an introduction based on the AP® curriculum and includes rich features that engage students in scientific practice and AP® test preparation; it also highlights careers and research opportunities in biological sciences.

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