Fragments Of Fullerenes And Carbon Nanotubes Designed Synthesis Unusual Reactions And Coordination Chemistry


Explore the Practical Applications and Promising Developments of Graphene The Graphene Science Handbook is a six-volume set that describes graphene’s special structural, electrical, and chemical properties. The book considers how these properties can be used in different applications (including the development of batteries, fuel cells, photovoltaic cells, and supercapacitors based on graphene) and produced on a massive and global scale. Volume One: Fabrication Methods Volume Two: Nanostructure and Atomic Arrangement Volume Three: Electrical and Optical Properties Volume Four: Mechanical and Chemical Properties Volume Five: Size-Dependent Properties Volume Six: Applications and Industrialization This handbook describes the fabrication methods of graphene; the nanostructure and atomic arrangement of graphene; graphene’s electrical and optical properties; the mechanical and chemical properties of graphene; the size effects in graphene, characterization, and applications based on size-affected properties; and the application and industrialization of graphene. Volume six is dedicated to the application and industrialization of graphene and covers: The design of graphene- and biomolecule-based nanosensors and nanodevices The use of graphene-based field-effect-transistor (GFET)-like structures as sensing substrates and DNA aptamers as sensing elements Recent advances in graphene-based DNA sensors The antibacterial properties of graphene-based nanomaterial (NM) The chemical and physical properties of graphene and its current uses The development of sensitive and selective field-effect transistors (FET) biosensors based on graphene The unique properties of ordered graphene (G) Various methods currently employed for the production of graphene nanocomposites The supramolecular chemistry of graphene derivatives, and more.

Fullerene Collision Reactions provides a comprehensive overview of the state-of-the-art of fullerene collision studies. The book begins with introductory chapters that provide the necessary background in experimental and theoretical techniques. This is followed by experimental results and theoretical calculations covering the wide
range of available gas-phase fullerene collision experiments. Emphasis is placed on
gas-phase molecular beam experiments where reaction, fragmentation and charge
collision cross sections have been determined covering collision energy ranges from
thermal to MeV. Atomic, ionic, electronic, cluster and surface collisions involving
fullerenes are covered in depth accompanied by a clear presentation of the most
commonly applied experimental and theoretical techniques. This book will be an
invaluable resource for senior undergraduate students, graduate students and
researchers working in the field.

In this handbook, the leading experts in the field presents important and
fundamental aspects of the organic and organometallic chemistry of fullerenes.
Naturally they also cover the applications in material and medicinal science for
these fascinating molecules. Completely self-contained, the book is logically
arranged such that information is easy to retrieve, and the style lends itself to
effortless reading and to learning more about the chemical properties of this family
of molecules. A definitive "must" for everyone working in this ever-expanding
sphere.

In recent decades, graphene composites have received considerable attention due to
their unique structural features and extraordinary properties. 2D and 3D graphene
hybrid structures are widely used in memory, microelectronic, and optoelectronic
devices; energy- and power-density supercapacitors; light-emitting diodes; and
sensors, batteries, and solar cells. This book covers the fundamental properties of
the latest graphene-based 2D and 3D composite materials. The book is a result of the
collective work of many highly qualified specialists in the field of experimental
and theoretical research on graphene and its derivatives. It describes experimental
methods for obtaining and characterizing samples of chemically modified graphene,
details conceptual foundations of popular methods for computer modeling of graphene
nanostructures, and compiles original computational techniques developed by the
chapter authors. It discusses the potential application areas and modifications of
graphene-based 2D and 3D composite materials and interprets the interesting physical
effects discovered for the first time for graphene materials under consideration.
The book is useful for graduate students and researchers as well as specialists in
industrial engineering. It will also appeal to those involved in materials science,
condensed matter physics, nanotechnology, physical electronics, nano- and
optoelectronics.

Review of current understanding of organic matter in space, identifying areas where
new ideas are required to further our understanding.

Following in the lineage of Adsorption by Carbons (Bottani & Tascon, 2008), this
work explores current research within contemporary novel carbon adsorbents. Both
basic and applied aspects are discussed for this important class of materials. The
first section of the book introduces physical adsorption and carbonaceous materials,
and is followed by a section concerning the fundamentals of adsorption by carbons.
This leads to development of a series of theoretical concepts that serve as an
introduction to the following section in which adsorption is mainly envisaged as a
tool to characterize the porous texture and surface chemistry of carbons. Particular
attention is paid to novel nanocarbons, and the electrochemistry of adsorption by
 carbons is also addressed. Finally, several important technological applications of
gas and liquid adsorption by carbons in areas such as environmental protection and
energy storage constitute the last section of the book. Encompasses fundamental
science of adsorption by carbons, in one location, supporting current R&D without
extensive literature review. Describes adsorption as it is currently applied to major
novel types of carbon materials, including carbon gels, carbide-derived carbons,
zeolite-templated carbons, hydrothermal carbons, carbon nanohorns and graphene
Specific discussion of fuel storage, environmental remediation and biomedical
applications, of contemporary interest to many surface chemists and applications-
focused researchers.
Collating our current knowledge and the latest developments for enabling breakthrough discoveries, this book focuses on the synthesis and applications of materials that are based on supramolecular assemblies of carbon nanostructures, with an emphasis on fullerenes and nanotubes. In so doing, it provides readers with an overview of the different types of supramolecular architectures, accentuating the outstanding geometrical, electronic and photophysical properties of the building blocks and the resulting structures. It makes use of basic concepts and real-life applications -- from simple syntheses to complex architectures, from instructive examples to working experimental procedures, and from photophysics to solar cells. A large part of each chapter is devoted to the methods and possibilities of controlling and tuning these molecular assemblies in order to obtain working devices. Fascinating reading for materials scientists, organic chemists, molecular physicists, and those in the semiconductor industry.

The study of nanostructures has become, in recent years, a theme common to many disciplines, in which scientists and engineers manipulate matter at the atomic and molecular level in order to obtain materials and systems with significantly improved properties. Carbon nanomaterials have a unique place in nanoscience owing to their exceptional thermal, electrical, chemical, and mechanical properties, finding application in areas as diverse as super strong composite materials, energy storage and conversion, supercapacitors, smart sensors, targeted drug delivery, paints, and nanoelectronics. This book is the first to cover a broad spectrum of carbon nanomaterials, namely carbon nanofibers, vapor-grown carbon fibers, different forms of amorphous nanocarbons besides carbon nanotubes, fullerenes, graphene, graphene nanoribbons, graphene quantum dots, etc. in a single volume.

In the period of rapid and intensive development of general electronics, this book entitled Fullerenes and Relative Materials - Properties and Applications is quite systematic and useful. It considers some aspects on synthesis, structural, vibrational, tribology, and optical properties of the fullerenes and relative materials. Some parts of the book present the specific area of the applications of the studied nanostructures. The book contains eight chapters. The special approach and interesting results on the unique properties of the materials studied as well as the different areas of their applications in general optoelectronics, solar energy and gas storage, laser and display, and biomedicine are shown. It is important for education process and for the civil and special device operations.

Carbon-based nanomaterials are rapidly emerging as one of the most fascinating materials in the twenty-first century. Chemical Functionalization of Carbon Nanomaterials: Chemistry and Applications provides a thorough examination of carbon nanomaterials, including their variants and how they can be chemically functionalized. It also gives a comprehensive overview of current advanced applications of functionalized carbon nanomaterials, including the automotive, packaging, coating, and biomedical industries. The book covers modern techniques to characterize chemically functionalized carbon nanomaterials as well as characterization of surface functional groups. It includes contributions from international leaders in the field who highlight the multidisciplinary and interdisciplinary flexibility of functionalized carbon nanomaterials. The book illustrates how natural drawbacks to carbon nanomaterials, such as low solubility, can be countered by surface modifications and shows how to make modifications. It discusses developments in the use of carbon nanomaterials in several critical areas in scientific research and practice, including analytical chemistry, drug delivery, and water treatment. It explores market opportunities due to the versatility and increasing applicability of carbon nanomaterials. It also gives suggestions on the direction of the field from its current point, paving the way for future developments and finding new applications. Chemical Functionalization of Carbon Nanomaterials: Chemistry and Applications is a significant collection of findings in a rapidly developing field. It gives an in-depth look at the current achievements of research and practice while pointing you ahead to new possibilities in functionalizing and using carbon nanomaterials.
Although synthetic fullerenes have only been around for a few years, there are thousands of scientific articles dealing with them. This is the first monograph in the field and thus represents a vital source of information summarizing the most important and fundamental aspects of the organic and organometallic chemistry of the fullerenes. The book is logically arranged so that information is easy to retrieve, and the style lends itself to effortless reading and to learning more about the chemical properties of a family of molecules that constitute new building blocks for novel architectures in the ever-expanding universe of synthetic chemistry. Belongs on the shelves of university libraries as well as those of chemists interested in the art and science of structure and property manipulation by synthesis.

Fulleranes are a special class of carbon molecules derived from fullerenes whose double bonds are partially or at least theoretically fully saturated by hydrogen. The hydrogenation changes the chemical properties of fullerenes which can become susceptible to substitution reactions as opposed to addition reactions to the double bonds (present in common fullerenes). One of the most intriguing aspects of fulleranes is the fact that they have been thought to exist in the interstellar medium or even in certain circumstellar media. “Fulleranes: The Hydrogenated Fullerenes” presents the state of the art research, synthesis and properties of these molecules. This book also includes astrophysicists' and astrochemists' expectations regarding the presence of these molecules in space.

At the interface between chemistry, biology, and physics, fullerenes were one of the first objects to be dissected, scanned, and studied by the modern multi-specialty biotech community and are currently thriving in both research and practical application. Other members of the sp2 nanocarbon family, such as nanotubes and graphene, are currently being

The creation of the hollow carbon buckminsterfullerene molecule as well as methods to produce and purify bulk quantities of it has triggered an explosive growth of research in the field. Superconducting and magnetic fullerenes, atoms trapped inside the fullerene cage, chemically bonded fullerene complexes, and nanometer-scale helical carbon tubes are some of the leading areas that have generated much excitement. This book is intended as a guide to the literature for the scientist who is just entering fullerene research, and will be one more valuable volume to the collection for the established worker. It contains reprints of some sixty most important research papers, with focus especially on those papers that have guided further work in the field. There is also a short review of the field, with references to many other publications.

Carbon nanotubes have been studied extensively in relation to fullerenes, and together with fullerenes have opened a new science and technology field on nano scale materials. A whole range of issues from the preparation, structure, properties and observation of quantum effects in carbon nanotubes in comparison with 0-D fullerenes are discussed. In addition, complementary reviews on carbon nanoparticles such as carbon nano-capsules, onion-like graphite particles and metal-coated fullerenes are covered. This book aims to cover recent research and development in this area, and so provide a convenient reference tool for all researchers in this field. It is also hoped that this book can serve to stimulate future work on carbon nanotubes.

A concise and practical overview of the most important modern synthetic aspects of conjugated polymers and carbon materials, including their properties and applications. Well structured, this book summarizes recent achievements, outlines the current state and reviews research trends. As such, a wide variety of polymerization techniques are included on both a strategic as well as a practical level, including Stille, Suzuki, and direct (hetero)arylation polymerizations. Furthermore, it covers various carbon-rich materials, such as graphene and carbon nanotubes, followed by a look at how the different synthetic pathways and strategies
influence their final properties, for example, for use in organic electronic
devices. The whole is rounded off with a discussion of future technology advances.
A n essential reference for newcomers as well as experienced researchers in the
field.

A decade has elapsed since the discovery of C60 in molecular beams, and five years
since the first synthesis of solid C60. At the time, the opening of a new era for
chemistry was foreseen and high expectations were shared by physicists and material
scientists. Where are we now? Where are we aiming? What can we expect from now on?
The answer will be found in this volume, written by the protagonists of the
fullerene adventure. There is a whole new generation of materials now, in the form
of molecules, solids, nanostructures, either directly derived from Bucky or inspired
by it. They continue to create new challenges to our fundamental understanding and
seem to be ready for important, long-lasting applications. Audience: The book is
mainly directed to specialized scientists - physicists, chemists, material
scientists and biochemists - who will find it a source of learning and inspiration.
Younger researchers, too, will find it fascinating, since it allows them to learn
about and quickly acquire a critical view of an interdisciplinary, frontier subject.

The book is a follow-up to the computerized fullerene bibliography related to the
1985-1993 period. It is a well-indexed overview of the journal literature on a topic
for which the 1996 Nobel Prize in Chemistry was awarded. It is an indispensable tool
for any specialist interested in the literature of one of the most researched
interdisciplinary topics in the sciences.

Observational, experimental and analytical data show that C60, larger fullerenes,
and related structures of elemental carbon exist in interstellar space, meteorites,
and on Earth and are associated with meteorite in impact events and in carbon-rich
environments such as coals (shungite) and bitumen. The existence of natural
fullerenes is at best contested and incompletely documented; realistically it is
still controversial. Their presence in astronomical environments can be
experimentally constrained but observationally they remain elusive. Fullerenes
formation in planetary environments is poorly understood. They survived for giga-
years when the environmental conditions were exactly right but even then only a
fraction of their original abundance survived. Natural fullerenes and related carbon
structures are found in interstellar space, in carbonaceous meteorites associated
with giant meteorite impacts (including at the Cretaceous-Tertiary boundary) as well
as in soot, coal and natural bitumen. This book provides an up-to-date summary of
the state of knowledge on natural fullerenes occurrences and the laboratory
techniques used to determine their presence at low concentration in rock samples. It
demonstrates that natural fullerenes exist and should be searched for in places not
yet considered such as carbon-containing deep-seated crustal rocks. Natural
Fullerenes and Related Structures of Elemental Carbon is written for professional
astronomers, meteoriticists, earth and planetary scientists, biologists and chemists
interested in carbon and hydrocarbon vapor condensation. It is an invaluable
resource for practicing research scientists and science teachers in Earth and

This is the only up-to-date book on the market to focus on the synthesis of these
compounds in this particularly suitable way. A team of excellent international
authors guarantees high-quality content, covering such topics as monodisperse carbon-
rich oligomers, molecular electronic wires, polyaromatic hydrocarbons, nonconjugated
small molecules, nanotubes, fullerenes, polyynes, macrocycles, dendrimers,
phenylenes and diamondoid structures. The result is a must-have for everyone working
in this expanding and interdisciplinary field, including organic and polymer
chemists, materials scientists, and chemists working in industry.

This book is a stop-gap contribution to the science and technology of carbon plasmas
and carbon vapors. It strives to cover two strongly related fields: the molecular
quantum theory of carbon plasmas and carbon nanostructures; and the molecular and
atomic spectroscopy of such plasmas and vapors. These two fields of research are strongly intertwined and thus reinforce one another. Even though the use of carbon nanostructures is increasing by the day and their practical uses are emerging, there is no modern review on carbon plasmas, especially from molecular theoretical and spectroscopic viewpoints. The importance of the present book is therefore great from both educational and practical aspects. This review might be the first step towards bringing such textbooks into existence for university education. Similarly, for applied and engineering works in carbon nanostructures, the book provides a theoretical salient point for technologists in the field.

A method of forming synthetic diamond or diamond-like films on a substrate surface. The method involves the steps of providing a vapor selected from the group of fullerene molecules or an inert gas/fullerene molecule mixture, providing energy to the fullerene molecules consisting of carbon-carbon bonds, the energized fullerene molecules breaking down to form fragments of fullerene molecules including C$_2$ molecules and depositing the energized fullerene molecules with C$_2$ fragments onto the substrate with further fragmentation occurring and forming a thickness of diamond or diamond-like films on the substrate surface.

The world’s leading experts contribute their expertise to this forthcoming book which presents the most current and comprehensive research on spheroidal carbon clusters (fullerenes) as well as discussing current problems and possible directions in future research.

A Positron Named Priscilla is a book of wonder, offering a fascinating, readable overview of cutting-edge investigations by many of today’s leading young scientists. Written for anyone who loves science, this volume reports on some of the most exciting recent discoveries and advances in fields from astronomy to molecular biology. This new book is from one of the world’s most prestigious scientific institutions, the National Academy of Sciences. The Academy provides an annual forum for the brightest young investigators to exchange ideas across disciplines—an exchange that was the spark for A Positron Named Priscilla. Each chapter is authored by a popular science writer who offers helpful historical perspectives, clear and well-illustrated explanations of current scientific thinking, and previews of future developments. The scope of topics and breadth of discussion ensure interest at all levels. Topics include Planetary science and the compelling glimpse through the clouded atmosphere of Venus afforded by the spacecraft Magellan. Astrophysics and the emergence of helioseismology, a new field that allows researchers to probe the interior workings of the sun. Biology and what we have learned about DNA in the 40 years since its discovery; our current understanding of protein molecules, the “building blocks” of living systems; and the high-tech search for answers to the AIDS epidemic. Physics and our new-found ability to move and manipulate individual atoms on a surface. The book also tells the remarkable story of “buckyballs,” or buckminsterfullerenes, a form of carbon discovered only a few years ago, that have the potential to be used in a variety of important applications, from superconductivity to nanotechnology. Mathematics and the rise of “wavelet” theory, and how mathematicians are applying it in sometimes startling ways, from assisting the FBI with fingerprint storage to coaxing the secrets from a battered recording of Brahms playing the piano. Geosciences and the search for “clocks in the earth” to make life-saving earthquake predictions. A Positron Named Priscilla is a “must” read for anyone who wants to keep up with a broad range of scientific endeavor.

The series Topics in Current Chemistry presents critical reviews of the present and future trends in modern chemical research. The scope of coverage is all areas of chemical science including the interfaces with related disciplines such as biology, medicine and materials science. The goal of each thematic volume is to give the non-specialist reader, whether in academia or industry, a comprehensive insight into an area where new research is emerging which is of interest to a larger scientific audience. Each review within the volume critically surveys one aspect of that topic and places it within the context of the volume as a whole. The most significant
development of the last 5 to 10 years are presented using selected examples to illustrate the principles discussed. The coverage is not intended to be an exhaustive summary of the field or include large quantities of data, but should rather be conceptual, concentrating on the methodological thinking that will allow the non-specialist reader to understand the information presented. Contributions also offer an outlook on potential future developments in the field. Review articles for the individual volumes are invited by the volume editors. Readership: research chemists at universities or in industry, graduate students.

This book discusses the methods synthesizing various carbon materials, like graphite, carbon blacks, carbon fibers, carbon nanotubes, and graphene. It also details different functionalization and modification processes used to improve the properties of these materials and composites. From a geometrical-structural point of view, it examines different properties of the composites, such as mechanical, electrical, dielectric, thermal, rheological, morphological, spectroscopic, electronic, optical, and toxic, and describes the effects of carbon types and their geometrical structure on the properties and applications of composites.

Fullerenes and nanotubes are two classes of carbon structures or allotropes, which were discovered about 17 years ago. Since that time, many chemical derivatives have been synthesized using fullerenes and nanotubes as building blocks. Particularly promising was the theory that the chemical properties of fullerenes, and certain derivatives, made them likely candidates for anticancer drugs, inhibitors of viruses such as HIV, or even as anti-bacterials. Their cytotoxicity can also be controlled by specific circumstances. In addition, the functionalization of nanotubes has not only produced relatively simple derivatives, but also complex hybrids with biological macromolecules, which show unique supramolecular architecture and which are promising in many medical applications. The application of fullerenes and nanotubes in medicine is at the frontier of our knowledge, thus the work in this field represents the basis for future novel developments.

The Carbon Nanomaterials Sourcebook contains extensive, interdisciplinary coverage of carbon nanomaterials, encompassing the full scope of the field—from physics, chemistry, and materials science to molecular biology, engineering, and medicine—in two comprehensive volumes. Written in a tutorial style, this second volume of the sourcebook: Focuses on nanoparticles, nanocapsules, nanofibers, nanoporous structures, and nanocomposites Describes the fundamental properties, growth mechanisms, and processing of each nanomaterial discussed Explores functionalization for electronic, energy, biomedical, and environmental applications Showcases materials with exceptional properties, synthesis methods, large-scale production techniques, and application prospects Provides the tools necessary for understanding current and future technology developments, including important equations, tables, and graphs Each chapter is dedicated to a different type of carbon nanomaterial and addresses three main areas: formation, properties, and applications. This setup allows for quick and easy search, making the Carbon Nanomaterials Sourcebook: Nanoparticles, Nanocapsules, Nanofibers, Nanoporous Structures, and Nanocomposites a must-have reference for scientists and engineers.

Handbook of Carbon-Based Nanomaterials provides a comprehensive overview of carbon-based nanomaterials and recent advances in these specialized materials. This book opens with a brief introduction to carbon, including the different forms of carbon and their range of uses. Each chapter systematically covers a different type of carbon-based nanomaterial, including its individual characteristics, synthesis techniques and applications in industry, biomedicine and research. This book offers a broad handbook on carbon-based nanomaterials, detailing the materials aspects, applications and recent advances of this expansive topic. With its global team of contributing authors, Handbook of Carbon-Based Nanomaterials collates specific technical expertise from around the world, for each type of carbon-based nanomaterial. Due to the broad nature of the coverage, this book will be useful to an interdisciplinary readership, including researchers in academia and industry in
the fields of materials science, engineering, chemistry, energy and biomedical engineering. Covers a range of carbon-based nanomaterials, including graphene, fullerenes and much more. Describes key properties, synthesis techniques and characterization of each carbon-based nanomaterial. Discusses a range of applications of carbon-based nanomaterials, from biomedicine to energy applications.

This is a 1999 book on carbon nanotubes, one of the most exciting areas in materials chemistry.

This book presents theoretical studies of electronic structure, optical and spectroscopic properties of a number of compounds such as porphyrins, fullerenes and heteroatomic single-wall nanotubes. The book presents new, faster calculation methods for application in quantum-chemical theory of electronic structures. It addresses issues of practical importance such as the development of materials for photosensitizers, organic LEDs and solar cells.

This book is the first of its kind to reflect upon the intense and rapidly growing interest in open geodesic polyaromatic molecules, specifically focusing on their synthesis and reactivity in metal binding reactions. The book broadly covers all aspects related to the fullerene fragment chemistry: current synthetic techniques, description of the available members of this new family (which has grown to more than two dozens members, with none being available commercially), molecular geometry and trends in the solid state packing, as well as extensions into physical properties and new buckybowel-based molecules and materials. It covers fundamental research related to a new class of hydrocarbons, namely open geodesic polyarenes that map onto the surfaces of fullerenes (and referred to as fullerene fragments or buckybowls).

This book presents carbon nanotubes as a potential material for the development of new waste water treatment technologies. Reviews on adsorption, catalysis, membrane, filtration and disinfection methods are provided. A special chapter presents the use of carbon nanotubes to sense and monitor water pollutants. The text underlies each technology and process as well as the current commercialization efforts. Research gaps are highlighted at the end with links to further reading material in the field.

The discovery of fullerenes (also known as buckyballs) has generated tremendous excitement and opened up a new field of carbon chemistry. As the first book available on this topic, this volume will be a landmark reference in the field. Because buckyballs are essentially closed hollow cages made up of carbon atoms, they can be manipulated in a variety of ways to yield never-before-seen materials. The balls can, for instance, be doped with atoms or pulled out into tubules and filled with lead to provide properties of high-temperature superconductivity. Researchers can now create their own buckyballs in a process that is almost as simple as making soot, making this research as inexpensive as it is exotic (which has doubtless contributed to its popularity). Researchers anticipate that fullerenes will offer boundless opportunities in the development of new products, drugs and materials. Science of Fullerenes and Carbon Nanotubes introduces materials scientists, chemists, and solid state physicists to the field of fullerenes, and discusses the unique properties and applications, both current and future, of all classes of fullerenes. Key Features * First comprehensive resource on fullerenes and their applications * Provides an introduction to the topic * Presents an extensive discussion of current and future applications of Fullerenes * Covers all classes of fullerenes.

The 2003 International Conference "Hydrogen Materials Science and Chemistry of Carbon Nanomaterials" was held in September 2003. In the tradition of the earlier ICHMS conferences, this meeting served as an interdisciplinary forum for the presentation and discussion of the most recent research on transition to hydrogen-based energy systems, technologies for hydrogen production, storage, utilization, materials, energy and environmental problems. The aim of the volume is to provide an
overview of the latest scientific results on research and development in the different topics cited above. The representatives from industry, public laboratories, universities and governmental agencies have presented the most recent advances in hydrogen concepts, processes and systems, to evaluate current progress in these areas of investigations and to identify promising research directions for the future.

Chemistry as a Game of Molecular Construction: The Bond-Click Way utilizes an innovative and engaging approach to introduce students to the basic concepts and universal aspects of chemistry, with an emphasis on molecules’ beauty and their importance in our lives. • Offers a unique approach that portrays chemistry as a window into mankind’s material-chemical essence • Reveals the beauty of molecules through the “click” method, a teaching methodology comprised of the process of constructing molecules from building blocks • Styles molecular construction in a way that reveals the universal aspect of chemistry • Allows students to construct molecules, from the simple hydrogen molecule all the way to complex strands of DNA, thereby showing the overarching unity of matter • Provides problems sets and solutions for each chapter

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