

Chapter 3 Carbon And The Molecular Diversity Of Life

A thorough presentation of analytical methods for characterizing soil chemical properties and processes, Methods, Part 3 includes chapters on Fourier transform infrared, Raman, electron spin resonance, x-ray photoelectron, and x-ray absorption fine structure spectroscopies, and more.

NOTE: This loose-leaf, three-hole punched version of the textbook gives you the flexibility to take only what you need to class and add your own notes -- all at an affordable price. For loose-leaf editions that include MyLab(tm) or Mastering(tm), several versions may exist for each title and registrations are not transferable. You may need a Course ID, provided by your instructor, to register for and use MyLab or Mastering products. For introductory biology course for science majors Focus. Practice. Engage. Built unit-by-unit, Campbell Biology in Focus achieves a balance between breadth and depth of concepts to move students away from memorization. Streamlined content enables students to prioritize essential biology content, concepts, and scientific skills that are needed to develop conceptual understanding and an ability to apply their knowledge in future courses. Every unit takes an approach to streamlining the material to best fit the needs of instructors and students, based on reviews of over 1,000 syllabi from across the country, surveys, curriculum initiatives, reviews, discussions with hundreds of biology professors, and the Vision and Change in Undergraduate Biology Education report. Maintaining the Campbell hallmark standards of accuracy, clarity, and pedagogical innovation, the 3rd Edition builds on this foundation to help students make connections across chapters, interpret real data, and synthesize their knowledge. The new edition integrates new, key scientific findings throughout and offers more than 450 videos and animations in Mastering Biology and embedded in the new Pearson eText to help students actively learn, retain tough course concepts, and successfully engage with their studies and assessments. Also available with Mastering Biology By combining trusted author content with digital tools and a flexible platform, Mastering personalizes the learning experience and improves results for each student. Integrate dynamic content and tools with Mastering Biology and enable students to practice, build skills, and apply their knowledge. Built for, and directly tied to the text, Mastering Biology enables an extension of learning, allowing students a platform to practice, learn, and apply outside of the classroom. Note: You are purchasing a standalone product; Mastering Biology does not come packaged with this content. Students, if interested in purchasing this title with Mastering Biology ask your instructor for the correct package ISBN and Course ID. Instructors, contact your Pearson representative for more information. If you would like to purchase both the loose-leaf version of the text and Mastering Biology search for: 0134988361 / 9780134988368 Campbell Biology in Focus, Loose-Leaf Plus Mastering Biology with Pearson eText -- Access Card Package Package consists of: 013489572X / 9780134895727 Campbell Biology in Focus, Loose-Leaf Edition 013487451X / 9780134874517 Mastering Biology with Pearson eText -- ValuePack Access Card -- for Campbell Biology in Focus

To achieve goals for climate and economic growth, "negative emissions technologies" (NETs) that remove and sequester carbon dioxide from the air will need to play a significant role in mitigating climate change. Unlike carbon capture and storage technologies that remove carbon dioxide emissions directly from large point sources such as coal power plants, NETs remove carbon dioxide directly from the atmosphere or enhance natural carbon sinks. Storing the carbon dioxide from NETs has the same impact on the atmosphere and climate as simultaneously preventing an equal amount of carbon dioxide from being emitted. Recent analyses found that deploying NETs may be less expensive and less disruptive than reducing some emissions, such as a substantial portion of agricultural and land-use emissions and some transportation emissions. In 2015, the National Academies published Climate Intervention: Carbon Dioxide Removal and Reliable Sequestration, which described and initially assessed NETs and sequestration technologies. This report acknowledged the relative paucity of research on NETs and recommended development of a research agenda that covers all aspects of NETs from fundamental science to full-scale deployment. To address this need, Negative Emissions Technologies and Reliable Sequestration: A Research Agenda assesses the benefits, risks, and "sustainable scale potential" for NETs and sequestration. This report also defines the essential components of a research and development program, including its estimated costs and potential impact.

The search for life in the solar system and beyond has to date been governed by a model based on what we know about life on Earth (terran life). Most of NASA's mission planning is focused on locations where liquid water is possible and emphasizes searches for structures that resemble cells in terran organisms. It is possible, however, that life exists that is based on chemical reactions that do not involve carbon compounds, that occurs in solvents other than water, or that involves oxidation-reduction reactions without oxygen gas. To assist NASA incorporate this possibility in its efforts to search for life, the NRC was asked to carry out a study to evaluate whether nonstandard biochemistry might support life in solar system and conceivable extrasolar environments, and to define areas to guide research in this area. This book presents an exploration of a limited set of hypothetical chemistries of life, a review of current knowledge concerning key questions or hypotheses about nonterran life, and suggestions for future research.

The contents of this monograph are two-scope. First, it intends to provide a synthetic but complete account of the thermodynamic and kinetic foundations on which the reaction path modeling of geological CO₂ sequestration is based. In particular, a great effort is devoted to review the thermodynamic properties of CO₂ and of the CO₂-H₂O system and the interactions in the aqueous solution, the thermodynamic stability of solid product phases (by means of several stability plots and activity plots), the volumes of carbonation reactions, and especially the kinetics of dissolution/precipitation reactions of silicates, oxides, hydroxides, and carbonates. Second, it intends to show the reader how reaction path modeling of geological CO₂ sequestration is carried out. To this purpose the well-known high-quality EQ3/6 software package is used. Setting up of computer simulations and obtained results are described in detail and used EQ3/6 input files are given to guide the reader step-by-step from the beginning to the end of these exercises. Finally, some examples of reaction-path- and reaction-transport-modeling taken from the available literature are presented. The results of these simulations are of fundamental importance to evaluate the amounts of potentially sequestered CO₂, and their evolution with time, as well as the time changes of all the other relevant geochemical parameters (e.g., amounts of solid reactants and products, composition of the aqueous phase, pH, redox potential, effects on aquifer porosity). In other words, in this way we are able to predict what occurs when CO₂ is injected into a deep aquifer. * Provides applications for investigating and predicting geological carbon dioxide sequestration * Reviews the geochemical literature in the field * Discusses the importance of geochemists in the multidisciplinary study of geological carbon dioxide sequestration

Marine dissolved organic matter (DOM) is a complex mixture of molecules found throughout the world's oceans. It plays a key role in the export, distribution, and sequestration of carbon in the oceanic water column, posited to be a source of atmospheric climate regulation. Biogeochemistry of Marine Dissolved Organic Matter, Second Edition, focuses on the chemical constituents of DOM and its biogeochemical, biological, and ecological significance in the global ocean, and provides a single, unique source for the references, information, and informed judgments of the community of marine biogeochemists.

Presented by some of the world's leading scientists, this revised edition reports on the major advances in this area and includes new chapters covering the role of DOM in ancient ocean carbon cycles, the long term stability of marine DOM, the biophysical dynamics of DOM, fluvial DOM qualities and fate, and the Mediterranean Sea. Biogeochemistry of Marine Dissolved Organic Matter, Second Edition, is an extremely useful resource that helps people interested in the largest pool of active carbon on the planet (DOC) get a firm grounding on the general paradigms and many of the relevant references on this topic. Features up-to-date knowledge of DOM, including five new chapters The only published work to synthesize recent research on dissolved organic carbon in the Mediterranean Sea Includes chapters that

address inputs from freshwater terrestrial DOM

Carbon materials are exceptionally diverse in their preparation, structure, texture, and applications. In *Advanced Materials Science and Engineering of Carbon*, noted carbon scientist Michio Inagaki and his coauthors cover the most recent advances in carbon materials, including new techniques and processes, carbon materials synthesis, and up-to-date descriptions of current carbon-based materials, trends and applications. Beginning with the synthesis and preparation of nanocarbons, carbon nanotubes, and graphenes, the book then reviews recently developed carbonization techniques, such as templating, electrospinning, foaming, stress graphitization, and the formation of glass-like carbon. The last third of the book is devoted to applications, featuring coverage of carbon materials for energy storage, electrochemical capacitors, lithium-ion rechargeable batteries, and adsorptive storage of hydrogen and methane for environmental protection, photocatalysis, spilled oil recovery, and nuclear applications of isotropic high-density graphite. A progression from synthesis through modern carbonization techniques to applications gives you a thorough understanding of carbon materials. Covers a wide range of precursor materials, preparation techniques, and characteristics to inspire your own development of carbonization techniques, carbon materials and applications. Applications-oriented chapters include timely content on hot topics such as the engineering of carbon nanofibers and carbon materials for various energy-related applications.

Mechanochemical Organic Synthesis is a comprehensive reference that not only synthesizes the current literature but also offers practical protocols that industrial and academic scientists can immediately put to use in their daily work. Increasing interest in green chemistry has led to the development of numerous environmentally-friendly methodologies for the synthesis of organic molecules of interest. Amongst the green methodologies drawing attention, mechanochemistry is emerging as a promising method to circumvent the use of toxic solvents and reagents as well as to increase energy efficiency. The development of synthetic strategies that require less, or the minimal, amount of energy to carry out a specific reaction with optimum productivity is of vital importance for large-scale industrial production. Experimental procedures at room temperature are the mildest reaction conditions (essentially required for many temperature-sensitive organic substrates as a key step in multi-step sequence reactions) and are the core of mechanochemical organic synthesis. This green synthetic method is now emerging in a very progressive manner and until now, there is no book that reviews the recent developments in this area. Features cutting-edge research in the field of mechanochemical organic synthesis for more sustainable reactions. Integrates advances in green chemistry research into industrial applications and process development. Focuses on designing techniques in organic synthesis directed toward mild reaction conditions. Includes global coverage of mechanochemical synthetic protocols for the generation of organic compounds. The inspiration for this book came from an American Carbon Society Workshop entitled "Carbon Materials for Advanced Technologies" which was hosted by the Oak Ridge National Laboratory in 1994. Chapter 1 contains a review of carbon materials, and emphasizes the structure and chemical bonding in the various forms of carbon, including the four allotropes diamond, graphite, carbynes, and the fullerenes. In addition, amorphous carbon and diamond films, carbon nanoparticles, and engineered carbons are discussed. The most recently discovered allotrope of carbon, i.e., the fullerenes, along with carbon nanotubes, are more fully discussed in Chapter 2, where their structure-property relations are reviewed in the context of advanced technologies for carbon based materials. The synthesis, structure, and properties of the fullerenes and nanotubes, and modification of the structure and properties through doping, are also reviewed. Potential applications of this new family of carbon materials are considered. The manufacture and applications of adsorbent carbon fibers are discussed in Chapter 3. The manufacture, structure and properties of high performance fibers are reviewed in Chapter 4, and the manufacture and properties of vapor grown fibers and their composites are reported in Chapter 5. The properties and applications of novel low density composites developed at Oak Ridge National Laboratory are reported in Chapter 6. Coal is an important source of energy and an abundant source of carbon. The production of engineering carbons and graphite from coal via a solvent extraction route is described in Chapter 7. Applications of activated carbons are discussed in Chapters 8-10, including their use in the automotive arena as evaporative loss emission traps (Chapter 8), and in vehicle natural gas storage tanks (Chapter 9). The application of activated carbons in adsorption heat pumps and refrigerators is discussed in Chapter 10. Chapter 11 reports the use of carbon materials in the fast growing consumer electronics application of lithium-ion batteries. The role of carbon materials in nuclear systems is discussed in Chapters 12 and 13, where fusion device and fission reactor applications, respectively, are reviewed. In Chapter 12 the major technological issues for the utilization of carbon as a plasma facing material are discussed in the context of current and future fusion tokamak devices. The essential design features of graphite moderated reactors, (including gas-, water- and molten salt-cooled systems) are reviewed in Chapter 13, and reactor environmental effects such as radiation damage and radiolytic corrosion are discussed. The fracture behaviour of graphite is discussed in qualitative and quantitative terms in Chapter 14. The applications of Linear Elastic Fracture Mechanics and Elastic-Plastic Fracture Mechanics to graphite are reviewed and a study of the role of small flaws in nuclear graphites is reported.

Carbon monoxide (CO) is a toxic air pollutant produced largely from vehicle emissions. Breathing CO at high concentrations leads to reduced oxygen transport by hemoglobin, which has health effects that include impaired reaction timing, headaches, lightheadedness, nausea, vomiting, weakness, clouding of consciousness, coma, and, at high enough concentrations and long enough exposure, death. In recognition of those health effects, the U.S. Environmental Protection Agency (EPA), as directed by the Clean Air Act, established the health-based National Ambient Air Quality Standards (NAAQS) for CO in 1971. Most areas that were previously designated as "nonattainment" areas have come into compliance with the NAAQS for CO, but some locations still have difficulty in attaining the CO standards. Those locations tend to have topographical or meteorological characteristics that exacerbate pollution. In view of the challenges posed for some areas to attain compliance with the NAAQS for CO, congress asked the National Research Council to investigate the problem of CO in areas with meteorological and topographical problems. This interim report deals specifically with Fairbanks, Alaska. Fairbanks was chosen as a case study because its meteorological and topographical characteristics make it susceptible to severe winter inversions that trap CO and other pollutants at ground level.

IPCC Report on sources, capture, transport, and storage of CO₂, for researchers, policy-makers and engineers.

Urbanization drastically alters the ecosystems structure and functions, disrupts cycling of C and other elements along with water. It alters the energy balance and influences climate at local, regional and global scales. In 2008, urban population exceeded the rural population. In 2050, 70% of the world population will live in urban centers. The number of megacities (10 million inhabitants) increased from three in 1975 to 19 in 2007, and is projected to be 27 in 2025. Rapid urbanization is altering the ecosystem C budget. Yet, urban ecosystems have a large C sink capacity in soils and biota. Judicious planning and effective management can enhance C pool in urban ecosystems, and off-set some of the anthropogenic emissions. Principal components with regards to C sequestration include home lawns and turfs, urban forests, green roofs, park and recreational/sports facilities and urban agriculture.

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

Materials Science and Engineering of Carbon: Characterization discusses 12 characterization techniques, focusing on their application to carbon materials, including X-ray diffraction, X-ray small-angle scattering, transmission electron microscopy, Raman spectroscopy, scanning electron microscopy, image analysis, X-ray photoelectron spectroscopy, magnetoresistance, electrochemical performance, pore structure analysis, thermal analyses, and quantification of functional groups. Each contributor in the book has worked on carbon materials for many years, and their background and experience will provide guidance on the development and research of carbon materials and their further applications. Focuses on characterization techniques for carbon materials Authored by experts who are considered specialists in their respective techniques Presents practical results on various carbon materials, including fault results, which will help readers understand the optimum conditions for the characterization of carbon materials

The signals are everywhere that our planet is experiencing significant climate change. It is clear that we need to reduce the emissions of carbon dioxide and other greenhouse gases from our atmosphere if we want to avoid greatly increased risk of damage from climate change. Aggressively pursuing a program of emissions abatement or mitigation will show results over a timescale of many decades. How do we actively remove carbon dioxide from the atmosphere to make a bigger difference more quickly? As one of a two-book report, this volume of Climate Intervention discusses CDR, the carbon dioxide removal of greenhouse gas emissions from the atmosphere and sequestration of it in perpetuity. Climate Intervention: Carbon Dioxide Removal and Reliable Sequestration introduces possible CDR approaches and then discusses them in depth. Land management practices, such as low-till agriculture, reforestation and afforestation, ocean iron fertilization, and land-and-ocean-based accelerated weathering, could amplify the rates of processes that are already occurring as part of the natural carbon cycle. Other CDR approaches, such as bioenergy with carbon capture and sequestration, direct air capture and sequestration, and traditional carbon capture and sequestration, seek to capture CO₂ from the atmosphere and dispose of it by pumping it underground at high pressure. This book looks at the pros and cons of these options and estimates possible rates of removal and total amounts that might be removed via these methods. With whatever portfolio of technologies the transition is achieved, eliminating the carbon dioxide emissions from the global energy and transportation systems will pose an enormous technical, economic, and social challenge that will likely take decades of concerted effort to achieve. Climate Intervention: Carbon Dioxide Removal and Reliable Sequestration will help to better understand the potential cost and performance of CDR strategies to inform debate and decision making as we work to stabilize and reduce atmospheric concentrations of carbon dioxide.

Inorganic solid adsorbents/sorbents are attractive materials for capturing carbon dioxide (CO₂) from flue gases after fossil fuel combustion. Post-combustion Carbon Dioxide Capture Materials introduces the key inorganic materials used as adsorbents/sorbents with specific emphasis on their design, synthesis, characterization, performance, and mechanism. Dedicated chapters cover carbon-based adsorbents, zeolite- and silica-based adsorbents, metal-organic framework (MOF)-based adsorbents, and alkali-metal-carbonate-based adsorbents. The final chapter discusses the practical application aspects of these adsorbents used in carbon dioxide capture from flue gases. Edited and written by world-renowned scientists in each class of the specific material, this book will provide a comprehensive introduction for advanced undergraduates, postgraduates and researchers from both academic and industrial fields wishing to learn about the topic.

Homogeneous and Heterogeneous Catalysis

All-carbon composites are carbon materials reinforced with other carbon materials, typically nanostructures such as carbon nanofibers or nanotubes. There are a large number of all-carbon materials, many of which demonstrate unique and useful sets of properties. Combining and hybridising different carbon materials and nanomaterials together also opens up a number of possibilities to fine-tune the materials for desirable combinations of these properties. All-carbon Composites and Hybrids provides a broad overview of these materials including discussions of synthesis, characterisation and the applications of a wide variety of all-carbon composite materials. This will be a useful volume for any researchers interested in carbon and nanotechnology.

Recent years have seen an expansion in speciality uses of activated carbons including medicine, filtration, and the purification of liquids and gaseous media. Much of current research and information surrounding the nature and use of activated carbon is scattered throughout various literature, which has created the need for an up-to-date comprehensive and integrated review reference. In this book, special attention is paid to porosities in all forms of carbon, and to the modern-day materials which use activated carbons - including fibres, clothes, felts and monoliths. In addition, the use of activated carbon in its granular and powder forms to facilitate usage in liquid and gaseous media is explored. Activated Carbon will make essential reading for Material Scientists, Chemists and Engineers in academia and industry. Characterization of porosity The surface chemistry of the carbons Methods of activation and mechanisms of adsorption Computer modelling of structure and porosity within carbons Modern instrumental analytical methods

Bioconjugate Techniques, 3rd Edition, is the essential guide to the modification and cross linking of biomolecules for use in research, diagnostics, and therapeutics. It provides highly detailed information on the chemistry, reagent systems, and practical applications for creating labeled or conjugate molecules. It also describes dozens of reactions, with details on hundreds of commercially available reagents and the use of these reagents for modifying or crosslinking peptides and proteins, sugars and polysaccharides, nucleic acids and oligonucleotides, lipids, and synthetic polymers. Offers a one-stop source for proven methods and protocols for synthesizing bioconjugates in the lab Provides step-by-step presentation makes the book an ideal source for researchers who are less familiar with the synthesis of bioconjugates Features full color illustrations Includes a more extensive introduction into the vast field of bioconjugation and one of the most thorough overviews of immobilization chemistry ever presented

% Place abstract below. Carbon nano-materials can be categorized by their hybridization and dimension: whether they are sp^2 or sp^3 hybridized, and whether they are zero, one, two or three dimensional material. A recent experiment breakthrough, cold compression of solid benzene into ordered product that is stable back to ambient condition, brought to the front stage a new sp^3 hybridized material which is also one dimensional, and this material, belonging in the category of one dimensional sp^3 carbon, has certain advantages over the previously considered polymers or nanowires: polymers have too much structural flexibility, nanowires are too wide that most of the atoms are still in the diamond bulk state. We name the material "carbon nanothread". Following a concise introduction in Chapter 1 of the structures and basic properties of carbon material classified by their hybridization and dimensionality and a practical introduction in Chapter 2 to the simulation methods used in studying carbon nanothreads, the author presents a systematic enumeration scheme to generate all the structure candidates for carbon nanothreads in Chapter 3, a work that has been published in early 2015. The visualization of the lowest energy structures and a brief discussion of their properties follow the enumeration scheme. In the later sections of Chapter 3, the author shows possible chemical reactions leading to these carbon nanothreads starting from benzene, along with the structures of intermediates, a work done not by the author himself but by the author's collaborators and a work that is an important and integral part to understand the whole picture of nanothreads. Some on-going and proposed directions to utilize the physical properties of carbon nanothreads for applications are proposed in Chapter 3 as well. With the structure candidates at hand, we are equipped to analyze the sample synthesized in experiments, by comparing the calculated observables of the candidate structures to the experiments, a topic of Chapter 4. Raman spectrum analysis is the most extensively studied one, and other experiments are also briefly mentioned. This part of the work is an on-going, unpublished effort. Tuning the reactions pathways by using different precursors will be interesting, and boron nitride nanothreads naturally comes into consideration by the analog of boron nitride nanotube. Chapter 5 focuses on the structures of boron nitride versions of nanothreads, starting from a proposed molecular precursor and covering all the possible intermediates and mapping out potential reaction pathways. Due to the partial ionic nature of boron nitride compound and symmetry breaking, some aspects of the polarization of BN nanothread, having a density as large as the common ferroelectric material $BaTiO_3$, are discussed, envisioning possible applications. In Chapter 6, the author's work prior to the nanothread efforts is presented. The work focuses on another category of carbon material: sp^2 hybridized carbon with true three-dimensional structures called "Schwarzite", a 3D structure with pores. A new structure design in this family of materials arises from the inclusion of a local carbon atom defect that has four nearest carbon neighbours but is embedded in the graphitic network. The role of such a defect in the possible synthesis of ordered Schwarzite structures is discussed.

Designed specifically for students of solid-state physics or engineering, this book introduces recent discoveries in carbon materials and demonstrates how these breakthroughs are useful to students' studies. The abundance of carbon coupled with its remarkable chemistry make the element unique and essential to life and the universe. This book offers a succinct introduction to the synthesis of carbon materials, their allotropes and the impact these have had on developmental science. By providing a uniquely encompassing and interlinked overview of carbon science, this text aids the reader in understanding the importance of carbon and how little we know about this mysterious but prevalent atom. The warming of the Earth has been the subject of intense debate and concern for many scientists, policy-makers, and citizens for at least the past decade. Climate Change Science: An Analysis of Some Key Questions, a new report by a committee of the National Research Council, characterizes the global warming trend over the last 100 years, and examines what may be in store for the 21st century and the extent to which warming may be attributable to human activity.

Guide to Biochemistry provides a comprehensive account of the essential aspects of biochemistry. This book discusses a variety of topics, including biological molecules, enzymes, amino acids, nucleic acids, and eukaryotic cellular organizations. Organized into 19 chapters, this book begins with an overview of the construction of macromolecules from building-block molecules. This text then discusses the strengths of some weak acids and bases and explains the interaction of acids and bases involving the transfer of a proton from an acid to a base. Other chapters consider the effectiveness of enzymes, which can be appreciated through the comparison of spontaneous chemical reactions and enzyme-catalyzed reactions. This book discusses as well structure and function of lipids. The final chapter deals with the importance and applications of gene cloning in the fundamental biological research, which lies in the preparation of DNA fragments containing a specific gene. This book is a valuable resource for biochemists and students.

How the amino acid sequence of a protein determines its three-dimensional structure is a major problem in biology and chemistry. Leading experts in the fields of NMR spectroscopy, X-ray crystallography, protein engineering and molecular modeling offer provocative insights into current views on the protein folding problem and various aspects for future progress.

One of the challenges under current land management practices is to increase food and soil security to meet projected trends in food production, while maintaining the resilience to climate change. This book provides a forum for researchers to access the most recent developments in enhancing carbon sinks and minimizing greenhouse gas emissions. It suggests that policies and practices integrating microbial

technology, modern crop cultivars, conservation practices, increased manure application, organic farming and agroforestry have a greater capacity to sequester carbon and reduce carbon-based greenhouse gases, leading to more robust agroecosystems compared to conventional agriculture. It is argued that empirical models can represent powerful tools for assessing how mitigation and adaptation strategies can be used to optimize crop yield and minimize greenhouse gas emissions under future climate change scen

The Biochemistry of Plants: A Comprehensive Treatise, Volume 6: Proteins and Nucleic Acids provides information pertinent to the nucleic acids and the regulation of the expression of this information. This book presents the processes by which the nucleic acids are finally expressed as proteins. Organized into 14 chapters, this volume begins with an overview of the overall structure of eukaryotic genomes, with emphasis on higher-plant DNA. This text then examines the enzymes involved in the cleavage and degradation of DNA. Other chapters provide a critical assessment of eukaryotic nucleic acid polymerases. This book discusses as well some examples from plant mitochondrial systems. The final chapter deals with two special areas of plant biology where the expression of the nucleic acids is seen in striking relief, the formation of plant tumors, and the growth and expression of plant viruses. This book is a valuable resource for plant biochemists, molecular biologists, senior graduate students, and research workers. Introduction to Carbon Science deals with various aspects of carbon science, from polymer science and prosthetics to crystallography, carbonization, spectroscopy, and surface science. Topics covered include the mechanisms of formation of isotropic and anisotropic carbons, physical properties of pitch relevant to the fabrication of carbon materials; kinetics and catalysis of carbon gasification; and porosity in carbons and graphites. Carbon fibers, cokes and composites, and coal to coke transformations are also discussed. This book is comprised of nine chapters and begins with an overview of the basic structural features of carbon materials, along with definitions of the various carbon forms encountered in carbon science. The principal techniques for studying the structure of solid carbons are also considered. The reader is then introduced to the mechanisms underlying the formation of isotropic and anisotropic carbons; the physicochemical changes that take place when pitch is pyrolyzed to carbon; and kinetics and catalysis of carbon gasification reactions. The following chapters explore various types of porosity in carbons and graphites; manufacture, properties, structure, and applications of carbon fibers; and mechanical properties of cokes and composites. This text concludes by describing the conversion of coal to coke. This monograph will be of interest to carbon scientists, technologists, and engineers, as well as those entering the field of carbon science for the first time.

Results from the National Research Council's (NRC) landmark study Diet and health are readily accessible to nonscientists in this friendly, easy-to-read guide. Readers will find the heart of the book in the first chapter: the Food and Nutrition Board's nine-point dietary plan to reduce the risk of diet-related chronic illness. The nine points are presented as sensible guidelines that are easy to follow on a daily basis, without complicated measuring or calculating--and without sacrificing favorite foods. Eat for Life gives practical recommendations on foods to eat and in a "how-to" section provides tips on shopping (how to read food labels), cooking (how to turn a high-fat dish into a low-fat one), and eating out (how to read a menu with nutrition in mind). The volume explains what protein, fiber, cholesterol, and fats are and what foods contain them, and tells readers how to reduce their risk of chronic disease by modifying the types of food they eat. Each chronic disease is clearly defined, with information provided on its prevalence in the United States. Written for everyone concerned about how they can influence their health by what they eat, Eat for Life offers potentially lifesaving information in an understandable and persuasive way.

Alternative Selection, Quality Paperback Book Club

Performance and efficiency demands in industrial applications are pushing a need for carbon fibers that can outperform existing technologies. Fibers that incorporate carbon nanotubes (CNTs) to enhance specific mechanical properties are a promising route to addressing this need. Some of the major roadblocks to unlocking the full potential of macroscopic fibers based on CNTs are controlling and optimizing the shear interactions within and between CNTs, geometrical organization of the CNTs, and structural properties of the individual CNTs. Several approaches have been pursued in order to optimize the mechanical behavior of CNT fibers, including irradiation-induced covalent cross-linking, reformable or rehealable bonding, and optimized geometrical and structural fiber designs. These approaches are inspired by nature, which uses hierarchical bonding schemes in optimized orientations to tailor the mechanical properties of its materials to the needs and environment of specific organisms. In this chapter, these approaches for developing high-performance CNT fibers will be reviewed, and an outlook of their potential impact will be discussed.

Concepts of Biology is designed for the single-semester introduction to biology course for non-science majors, which for many students is their only college-level science course. As such, this course represents an important opportunity for students to develop the necessary knowledge, tools, and skills to make informed decisions as they continue with their lives. Rather than being mired down with facts and vocabulary, the typical non-science major student needs information presented in a way that is easy to read and understand. Even more importantly, the content should be meaningful. Students do much better when they understand why biology is relevant to their everyday lives. For these reasons, Concepts of Biology is grounded on an evolutionary basis and includes exciting features that highlight careers in the biological sciences and everyday applications of the concepts at hand. We also strive to show the interconnectedness of topics within this extremely broad discipline. In order to meet the needs of today's instructors and students, we maintain the overall organization and coverage found in most syllabi for this course. A strength of Concepts of Biology is that instructors can customize the book, adapting it to the approach that works best in their classroom. Concepts of Biology also includes an innovative art program that incorporates critical thinking and clicker questions to help students understand--and apply--key concepts.

While a number of gases are implicated in global warming, carbon dioxide is the most important contributor, and in one sense the entire phenomena can be seen as a human-induced perturbation of the carbon cycle. The Global Carbon Cycle offers a scientific assessment of the state of current knowledge of the carbon cycle by the world's leading scientists sponsored by SCOPE and the Global Carbon Project, and other international partners. It gives an introductory over-view of the carbon cycle, with multidisciplinary contributions covering biological, physical, and social science aspects. Included are 29 chapters covering topics including: an assessment of carbon-climate-human interactions; a portfolio of carbon management options; spatial and temporal distribution of sources and sinks of carbon dioxide; socio-economic driving forces of emissions scenarios. Throughout, contributors emphasize that all parts of the carbon cycle are interrelated, and only by developing a framework that considers the full set of feedbacks will we be able to achieve a thorough understanding and develop effective management strategies. The Global Carbon Cycle edited by Christopher B. Field and Michael R. Raupach is part of the Rapid Assessment Publication series produced by the Scientific Committee on Problems of the Environment (SCOPE), in an effort to quickly disseminate the collective knowledge of the world's leading experts on topics of pressing environmental concern.

Written by an author with over 38 years of experience in the chemical and petrochemical process industry, this handbook will present an analysis of the process steps used to produce industrial hydrocarbons from various raw materials. It is the first book to offer a thorough analysis of external factors effecting production such as: cost, availability and environmental legislation. An A-Z list of raw materials and their properties are presented along with a commentary regarding their cost and availability. Specific processing operations described in the book include: distillation, thermal cracking and coking, catalytic methods, hydroprocesses, thermal and catalytic reforming, isomerization, alkylation

processes, polymerization processes, solvent processes, water removal, fractionation and acid gas removal. Flow diagrams and descriptions of more than 250 leading-edge process technologies An analysis of chemical reactions and process steps that are required to produce chemicals from various raw materials Properties, availability and environmental impact of various raw materials used in hydrocarbon processing

This book is intended to provide an in-depth understanding of ^{13}C NMR as a tool in biological research. ^{13}C NMR has provided unique information concerning complex biological systems, from proteins and nucleic acids to animals and humans. The subjects addressed include multidimensional heteronuclear techniques for structural studies of molecules in the liquid and solid states, the investigation of interactions in model membranes, the elucidation of metabolic pathways *in vitro* and *in vivo* on animals, and noninvasive metabolic studies performed on humans. The book is a unique mix of NMR methods and biological applications which makes it a convenient reference for those interested in research in this interdisciplinary area of physics, chemistry, biology, and medicine. An interdisciplinary text with emphasis on both ^{13}C NMR methodology and the relevant biological and biomedical issues State-of-the-art ^{13}C NMR techniques are described; Whenever possible, their advantages over other approaches are emphasized The chapters constitute comprehensive reviews and are written by acknowledged experts in their fields Chapters are written in a clear style, and include a large number of illustrations and comprehensive references

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.

Sugar chains (glycans) are often attached to proteins and lipids and have multiple roles in the organization and function of all organisms. "Essentials of Glycobiology" describes their biogenesis and function and offers a useful gateway to the understanding of glycans.

A comprehensive guide to carbon inside Earth - its quantities, movements, forms, origins, changes over time and impact on planetary processes. This title is also available as Open Access on Cambridge Core.

Addressing the growing global concern for sustainable engineering, *Materials and the Environment, 2e* is the only book devoted exclusively to the environmental aspects of materials. It explains the ways in which we depend on and use materials and the consequences these have, and it introduces methods for thinking about and designing with materials within the context of minimizing environmental impact. Along with its noted in-depth coverage of material consumption, the material life-cycle, selection strategies, and legislative aspects, the second edition includes new case studies, important new chapters on Materials for Low Carbon Power and Material Efficiency, all illustrated by in-text examples and expanded exercises. This book is intended for instructors and students as well as materials engineers and product designers who need to consider the environmental implications of materials in their designs. Introduces methods and tools for thinking about and designing with materials within the context of their role in products and the environmental consequences Contains numerous case studies showing how the methods discussed in the book can be applied to real-world situations Includes full-color data sheets for 40 of the most widely used materials, featuring such environmentally relevant information as their annual production and reserves, embodied energy and process energies, carbon footprints, and recycling data New to this edition: New chapter of Case Studies of Eco-audits illustrating the rapid audit method New chapter on Materials for Low Carbon Power examines the consequences for materials supply of a major shift from fossil-fuel based power to power from renewables New chapter exploring Material Efficiency, or design and management for manufacture to provide the services we need with the least production of materials Recent news-clips from the world press that help place materials issues into a broader context. are incorporated into all chapters End-of-chapter exercises have been greatly expanded The datasheets of Chapter 15 have been updated and expanded to include natural and man-made fibers

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