Introduction To Atmospheric Chemistry Solutions Manual

Introduction to Physical ChemistryInternational Global Atmospheric Chemistry (IGAC) ProjectThermodynamics of the AtmosphereThe EnvironmentEssentials of Atmospheric and Oceanic DynamicsIntroduction to General ChemistryAn Introduction to Atmospheric PhysicsAn Introduction to Air ChemistryBasic Physical Chemistry for the Atmospheric SciencesExoplanetary AtmospheresIntroduction to ChemistryAn Introduction to Atmospheric ThermodynamicsAtmospheric ChemistryEnvironmental and Pollution ScienceTurbulence in the AtmosphereIonospheresIntroduction to Atmospheric ChemistryAn Introduction to the Chemistry of the SeaAtmospheric Boundary LayerRethinking the Ozone Problem in Urban and Regional Air PollutionModern Analytical ChemistryIntroduction to Physical ChemistryNucleation and Atmospheric AerosolsAn Introduction to Atmospheric PhysicsModeling of Atmospheric ChemistryIntroduction to Atmospheric ChemistryPower Ultrasound in ElectrochemistryIntroduction to Atmospheric ChemistryAtmospheric ChemistryAir Composition and ChemistryAtmospheric ScienceAtmospheric Chemistry and PhysicsAir Composition and ChemistryAir Pollution and Global WarmingIntroduction to Physical ChemistryAtmospheric ThermodynamicsFundamentals of Atmospheric ModelingChemistry of the Upper and Lower AtmosphereAquatic Chemistry Concepts, Second

EditionWater in Confining Geometries

Introduction to Physical Chemistry

Introduction to Atmospheric Chemistry is a concise, clear review of the fundamental aspects of atmospheric chemistry. In ten succinct chapters, it reviews our basic understanding of the chemistry of the Earth's atmosphere and discusses current environmental issues, including air pollution, acid rain, the ozone hole, and global change. Written by a well-known atmospheric science teacher, researcher, and author of several established textbooks, this book is an introductory textbook for beginning university courses in atmospheric chemistry. Also suitable for self instruction, numerous exercises and solutions make this textbook accessible to students covering atmospheric chemistry as a part of courses in atmospheric science, meteorology, environmental science, geophysics and chemistry. Together with its companion volume, Basic Physical Chemistry for the Atmospheric Sciences (second edition 2000; Cambridge University Press), Introduction to Atmospheric Chemistry provides a solid introduction to atmospheric chemistry.

International Global Atmospheric Chemistry (IGAC) Project

Textbook that uniquely integrates physics and chemistry in the study of atmospheric thermodynamics for advanced single-semester

courses.

Thermodynamics of the Atmosphere

The Environment

Introduction to Atmospheric Chemistry is a concise, clear review of the fundamental aspects of atmospheric chemistry. In ten succinct chapters, it reviews our basic understanding of the chemistry of the Earth's atmosphere and discusses current environmental issues, including air pollution, acid rain, the ozone hole, and global change. Written by a well-known atmospheric science teacher, researcher, and author of several established textbooks, this book is an introductory textbook for beginning university courses in atmospheric chemistry. Also suitable for self instruction, numerous exercises and solutions make this textbook accessible to students covering atmospheric chemistry as a part of courses in atmospheric science, meteorology, environmental science, geophysics and chemistry. Together with its companion volume, Basic Physical Chemistry for the Atmospheric Sciences (second edition 2000; Cambridge University Press), Introduction to Atmospheric Chemistry provides a solid introduction to atmospheric chemistry.

Essentials of Atmospheric and Oceanic Dynamics

Introduction to General Chemistry

This book is about the atmosphere and our influence on its composition. The early chapters look at the geochemical, biological and maritime sources of the trace gases and are followed by chapters on the chemistry of atmospheric gases, suspended particles and rainfall. After dealing with the natural atmosphere the book examines the sources of air pollution and its effects: decline in health, damage to plants and animals, and to constructional materials, indoor pollution, acid rain and global changes in carbon dioxide and methane. The final chapters are concerned with the chemistry and pollution of the upper atmosphere and the composition and evolution of the atmospheres of the planets of the solar system.

An Introduction to Atmospheric Physics

Atmospheric particles are ubiquitous in the atmosphere: they form the seeds for cloud droplets and they form haze layers, blocking out incoming radiation and contributing to a partial cooling of our climate. They also contribute to poor air quality and health impacts. A large fraction of aerosols are formed from nucleation processes – that is a phase transition from vapour to liquid or solid particles. Examples are the formation of stable clusters about 1 nm in size from molecular collisions and these in turn can grow into larger (100 nm or more) haze particles via condensation to the formation of ice crystals in mixed phase or cold clouds. This book brings together the leading experts from the nucleation and

atmospheric aerosols research communities to present the current state-of-the-art knowledge in these related fields. Topics covered are: Nucleation Experiment & Theory, Binary, Homogeneous and Heterogeneous Nucleation, Ion & Cluster Properties During Nucleation, Aerosol Characterisation & Properties, Aerosol Formation, Dynamics and Growth, Marine Aerosol Production, Aerosol-Cloud Interactions, Chemical Composition & Cloud Drop Activation, Remote Sensing of aerosol & clouds and Air Quality-Climate Interactions

An Introduction to Air Chemistry

This is a self-contained, concise, rigorous book introducing the reader to the basics of atmospheric thermodynamics. This new edition has been brought completely up to date and reorganized to improve the quality and flow of the material. The introductory chapters provide definitions and useful mathematical and physical notes to help readers understand the basics. The book then describes the topics relevant to atmospheric processes, including the properties of moist air and atmospheric stability. It concludes with a brief introduction to the problem of weather forecasting and the relevance of thermodynamics. Each chapter contains worked examples and student exercises, with solutions available to instructors on a password protected website at www.cambridge.org/9780521796767. The author has taught atmospheric thermodynamics for over 20 years and is a highly respected researcher. This book is an ideal text for short undergraduate courses taken

as part of an atmospheric science, meteorology, physics or natural science program.

Basic Physical Chemistry for the Atmospheric Sciences

This is an intermediate to advanced undergraduate textbook presenting a broad coverage of atmospheric physics.

Exoplanetary Atmospheres

Aquatic Chemistry Concepts, Second Edition, is a fully revised and updated textbook that fills the need for a comprehensive treatment of aquatic chemistry and covers the many complicated equations and principles of aquatic chemistry. It presents the established science of equilibrium water chemistry using the uniquely recognizable, step-by-step Pankow format, which allows a broad and deep understanding of aquatic chemistry. The text is appropriate for a wide audience, including undergraduate and graduate students, industry professionals, consultants, and regulators. Every professional using water chemistry will want this text within close reach, and students and professionals alike will expect to find at least one copy on their library shelves. Key Features Extremely thorough, one-of-a-kind treatment of aquatic chemistry Discussions of how to carry out complex calculations regarding the chemistry of lakes, rivers, groundwater, and seawater Numerous example problems worked in complete detail Special foreword by Jerry L. Schnoor

Introduction to Chemistry

Describes the physical, plasma and chemical processes controlling ionospheres, upper atmospheres and exospheres, for researchers and graduates.

An Introduction to Atmospheric Thermodynamics

Mathematical modeling of atmospheric composition is a formidable scientific and computational challenge. This comprehensive presentation of the modeling methods used in atmospheric chemistry focuses on both theory and practice, from the fundamental principles behind models, through to their applications in interpreting observations. An encyclopaedic coverage of methods used in atmospheric modeling, including their advantages and disadvantages, makes this a one-stop resource with a large scope. Particular emphasis is given to the mathematical formulation of chemical, radiative, and aerosol processes; advection and turbulent transport; emission and deposition processes; as well as major chapters on model evaluation and inverse modeling. The modeling of atmospheric chemistry is an intrinsically interdisciplinary endeavour, bringing together meteorology, radiative transfer, physical chemistry and biogeochemistry, making the book of value to a broad readership. Introductory chapters and a review of the relevant mathematics make this book instantly accessible to graduate students and researchers in the atmospheric sciences.

Atmospheric Chemistry

An Introduction to Air Chemistry serves as a textbook on air chemistry and covers topics such as chemical principles, sampling and collection, treatment of data, and special methods of analysis. The atmospheric chemistry of sulfur compounds is also discussed, together with nitrogen compounds and ozone, aerosols, and carbon compounds. This book is comprised of nine chapters and begins with a review of the relevant chemical and meteorological principles. The general methods for obtaining and handling air chemical data are then described, followed by a discussion on three classes of chemical compounds that are important in any consideration of trace constituents of the atmosphere, namely, sulfur compounds, carbon compounds, and nitrogen compounds and ozone. Significant atmospheric reactions, the global budgets, and selected methods of analysis for these compounds are considered. The final chapter examines some of the physical characteristics of aerosols. This monograph will be a valuable resource for upper-level undergraduate and graduate-level students of analytical chemistry, meteorology, oceanography, and civil engineering, as well as for laboratory chemists, meteorologists, physical scientists, and technicians.

Environmental and Pollution Science

Turbulence in the Atmosphere

This work offers a broad coverage of atmospheric physics, including atmospheric thermodynamics, radiative transfer, atmospheric fluid dynamics and elementary atmospheric chemistry.

Ionospheres

This is a modern, introductory textbook on the dynamics of the atmosphere and ocean, with a healthy dose of geophysical fluid dynamics. It will be invaluable for intermediate to advanced undergraduate and graduate students in meteorology, oceanography, mathematics, and physics. It is unique in taking the reader from very basic concepts to the forefront of research. It also forms an excellent refresher for researchers in atmospheric science and oceanography. It differs from other books at this level in both style and content: as well as very basic material it includes some elementary introductions to more advanced topics. The advanced sections can easily be omitted for a more introductory course, as they are clearly marked in the text. Readers who wish to explore these topics in more detail can refer to this book's parent, Atmospheric and Oceanic Fluid Dynamics: Fundamentals and Large-Scale Circulation, now in its second edition.

Introduction to Atmospheric Chemistry

An Introduction to the Chemistry of the Sea

Based on more than 20 years of research and lecturing, Jordi Vil-Guerau de Arellano and his team's textbook provides an excellent introduction to the interactions between the atmosphere and the land for advanced undergraduate and graduate students and a reference text for researchers in atmospheric physics and chemistry, hydrology, and plant physiology. The combination of the book, which provides the essential theoretical concepts, and the associated interactive Chemistry Land-surface Atmosphere Soil Slab (CLASS) software, which provides hands-on practical exercises and allows students to design their own numerical experiments, will prove invaluable for learning about many aspects of the soil-vegetation-atmosphere system. This book has a modular and flexible structure, allowing instructors to accommodate it to their own learning-outcome needs.

Atmospheric Boundary Layer

A textbook on atmospheric thermodynamics for graduate students and researchers in meteorology and related sciences.

Rethinking the Ozone Problem in Urban and Regional Air Pollution

Students have questions, this book has answers: What is the structure and function of natural systems? Where and how do populations and communities live? How have human impacts altered ecosystems? How can we lessen impacts and create long term

solutions? Challenging Times Demand Changing Approaches As the world strives to go green and clean, the discipline of environmental science is poised to take center stage. Its components span many disciplines, subdisciplines, and specialties. Reflecting this, introductory courses are often taught by instructors trained in fields ranging from biology, chemistry, and physics to philosophy and political science. The next generation of environmental scientists, professionals, and decision makers need an understanding of environmental issues that is not only cohesive, but firmly based in science. They need environmental literacy. Why Another Text on Environmental Science? Exploiting the fertile ground provided by young and open minds, The Environment: Science, Issues, and Solutions employs a back-to-basics, building-block presentation. The authors' approach is strongly grounded in science, the scientific method, and environmental evidence. They introduce the principles of ecology, then discuss how the increase in human population, expanded technology use, and unprecedented economic development and growth has altered ecosystems resulting in serious local, regional, and global environmental problems. The book makes a case for seeking long-term solutions for the prevention and mitigation of environmental problems in their interconnected, interrelated, and, thus, interdependent ways. Fully Integrated Text Rigorously Explores Environmental Issues The authors' engaging style piques the interest of students, challenges their critical abilities, and fosters environmental literacy based on a fundamental understanding of the systems of the natural world. The authors emphasize

the basics of ecology and use this foundation to build an understanding of major environmental problems and explore methods of mitigating what has been degraded or destroyed. In a logical progression, they provide an understanding of the science, a delineation of the human population and technological growth that has led to environmental issues, and an exploration of solutions to those problems.

Modern Analytical Chemistry

Publisher Description

Introduction to Physical Chemistry

Atmospheric chemistry is one of the fastest growing fields in the earth sciences. Until now, however, there has been no book designed to help students capture the essence of the subject in a brief course of study. Daniel Jacob, a leading researcher and teacher in the field, addresses that problem by presenting the first textbook on atmospheric chemistry for a one-semester course. Based on the approach he developed in his class at Harvard, Jacob introduces students in clear and concise chapters to the fundamentals as well as the latest ideas and findings in the field. Jacob's aim is to show students how to use basic principles of physics and chemistry to describe a complex system such as the atmosphere. He also seeks to give students an overview of the current state of research and the work that led to this point. Jacob begins with atmospheric structure, design

of simple models, atmospheric transport, and the continuity equation, and continues with geochemical cycles, the greenhouse effect, aerosols, stratospheric ozone, the oxidizing power of the atmosphere, smog, and acid rain. Each chapter concludes with a problem set based on recent scientific literature. This is a novel approach to problem-set writing, and one that successfully introduces students to the prevailing issues. This is a major contribution to a growing area of study and will be welcomed enthusiastically by students and teachers alike.

Nucleation and Atmospheric Aerosols

Modern Analytical Chemistry is a one-semester introductory text that meets the needs of all instructors. With coverage in both traditional topics and modern-day topics, instructors will have the flexibilty to customize their course into what they feel is necessary for their students to comprehend the concepts of analytical chemistry.

An Introduction to Atmospheric Physics

New edition of introductory textbook, ideal for students taking a course on air pollution and global warming, whatever their background. Comprehensive introduction to the history and science of the major air pollution and climate problems facing the world today, as well as energy and policy solutions to those problems.

Modeling of Atmospheric Chemistry

Atmospheric Science, Second Edition, is the long-awaited update of the classic atmospheric science text, which helped define the field nearly 30 years ago and has served as the cornerstone for most university curricula. Now students and professionals alike can use this updated classic to understand atmospheric phenomena in the context of the latest discoveries, and prepare themselves for more advanced study and real-life problem solving. This latest edition of Atmospheric Science, has been revamped in terms of content and appearance. It contains new chapters on atmospheric chemistry, the Earth system, the atmospheric boundary layer, and climate, as well as enhanced treatment of atmospheric dynamics, radiative transfer, severe storms, and global warming. The authors illustrate concepts with full-color, state-of-the-art imagery and cover a vast amount of new information in the field. Extensive numerical and qualitative exercises help students apply basic physical principles to atmospheric problems. There are also biographical footnotes summarizing the work of key scientists, along with a student companion website that hosts climate data; answers to quantitative exercises; full solutions to selected exercises; skew-T log p chart; related links, appendices; and more. The instructor website features: instructor's guide; solutions to quantitative exercises; electronic figures from the book; plus supplementary images for use in classroom presentations. Meteorology students at both advanced undergraduate and graduate levels will find this book extremely useful. Full-color satellite imagery and cloud photographs illustrate principles

throughout Extensive numerical and qualitative exercises emphasize the application of basic physical principles to problems in the atmospheric sciences Biographical footnotes summarize the lives and work of scientists mentioned in the text, and provide students with a sense of the long history of meteorology Companion website encourages more advanced exploration of text topics: supplementary information, images, and bonus exercises

Introduction to Atmospheric Chemistry

Thoroughly restructured and updated with new findings and new features The Second Edition of this internationally acclaimed text presents the latest developments in atmospheric science. It continues to be the premier text for both a rigorous and a complete treatment of the chemistry of the atmosphere, covering such pivotal topics as: * Chemistry of the stratosphere and troposphere * Formation, growth, dynamics, and properties of aerosols * Meteorology of air pollution * Transport, diffusion, and removal of species in the atmosphere * Formation and chemistry of clouds * Interaction of atmospheric chemistry and climate * Radiative and climatic effects of gases and particles * Formulation of mathematical chemical/transport models of the atmosphere All chapters develop results based on fundamental principles, enabling the reader to build a solid understanding of the science underlying atmospheric processes. Among the new material are three new chapters: Atmospheric Radiation and Photochemistry, General Circulation of the

Atmosphere, and Global Cycles. In addition, the chapters Stratospheric Chemistry, Tropospheric Chemistry, and Organic Atmospheric Aerosols have been rewritten to reflect the latest findings. Readers familiar with the First Edition will discover a text with new structures and new features that greatly aid learning. Many examples are set off in the text to help readers work through the application of concepts. Advanced material has been moved to appendices. Finally, many new problems, coded by degree of difficulty, have been added. A solutions manual is available. Thoroughly updated and restructured, the Second Edition of Atmospheric Chemistry and Physics is an ideal textbook for upper-level undergraduate and graduate students, as well as a reference for researchers in environmental engineering, meteorology, chemistry, and the atmospheric sciences. Click here to Download the Solutions Manual for Academic Adopters: http://www.wiley.com/WileyCDA/Section/id-292291.html

Power Ultrasound in Electrochemistry

Here is the most comprehensive and up-to-date treatment of one of the hottest areas of chemical research. The treatment of fundamental kinetics and photochemistry will be highly useful to chemistry students and their instructors at the graduate level, as well as postdoctoral fellows entering this new, exciting, and well-funded field with a Ph.D. in a related discipline (e.g., analytical, organic, or physical chemistry, chemical physics, etc.). Chemistry of the Upper and Lower Atmosphere provides postgraduate

researchers and teachers with a uniquely detailed, comprehensive, and authoritative resource. The text bridges the "gap" between the fundamental chemistry of the earth's atmosphere and "real world" examples of its application to the development of sound scientific risk assessments and associated risk management control strategies for both tropospheric and stratospheric pollutants. Serves as a graduate textbook and "must have" reference for all atmospheric scientists Provides more than 5000 references to the literature through the end of 1998 Presents tables of new actinic flux data for the troposphere and stratospher (0-40km) Summarizes kinetic and photochemical date for the troposphere and stratosphere Features problems at the end of most chapters to enhance the book's use in teaching Includes applications of the OZIPR box model with comprehensive chemistry for student use

Introduction to Atmospheric Chemistry

Engagingly introduces marine chemistry and the ocean's geochemical interactions with the solid earth and atmosphere, for students of oceanography.

Atmospheric Chemistry

Air Composition and Chemistry

Despite more than 20 years of regulatory efforts, concern is widespread that ozone pollution in the lower atmosphere, or troposphere, threatens the

health of humans, animals, and vegetation. This book discusses how scientific information can be used to develop more effective regulations to control ozone. Rethinking the Ozone Problem in Urban and Regional Air Pollution discusses: The latest data and analysis on how tropospheric ozone is formed. How well our measurement techniques are functioning. Deficiencies in efforts to date to control the problem. Approaches to reducing ozone precursor emissions that hold the most promise. What additional research is needed. With a wealth of technical information, the book discusses atmospheric chemistry, the role of oxides of nitrogen (NOx) and volatile organic compounds (VOCs) in ozone formation, monitoring and modeling the formation and transport processes, and the potential contribution of alternative fuels to solving the tropospheric ozone problem. The committee discusses criteria for designing more effective ozone control efforts. Because of its direct bearing on decisions to be made under the Clean Air Act, this book should be of great interest to environmental advocates, industry, and the regulatory community as well as scientists, faculty, and students.

Atmospheric Science

The use of power ultrasound to promote industrial electrochemical processes, or sonoelectrochemistry, was first discovered over 70 years ago, but recently there has been a revived interest in this field. Sonoelectrochemistry is a technology that is safe, cost-effective, environmentally friendly and energy

efficient compared to other conventional methods. The book contains chapters on the following topics, contributed from leading researchers in academia and industry: Use of electrochemistry as a tool to investigate Cavitation Bubble Dynamics Sonoelectroanalysis Sonoelectrochemistry in environmental applications Organic Sonoelectrosynthesis Sonoelectrodeposition Influence of ultrasound on corrosion kinetics and its application to corrosion tests Sonoelectropolymerisation Sonoelectrochemical production of nanomaterials Sonochemistry and Sonoelectrochemistry in hydrogen and fuel cell technologies

Atmospheric Chemistry and Physics

This book draws upon the knowledge and experience of modeling experts currently engaged in conducting assessments regarding the predictive strength of atmospheric models. The book covers all of the major important atmospheric areas, including large scale models for ozone depletion and global warming, regional scale models for urban smog (ozone and visibility impairment) and acid rain, as well as accompanying models of cloud processes and biofeedbacks. Atmospheric scientists and regulators should consider this book required reading.

Air Composition and Chemistry

Written by leading experts in the field, this book gives a wide-ranging and coherent treatment of water in confining geometries. It compiles and relates

interdisciplinary work on this hot topic of research important in many areas of science and technology.

Air Pollution and Global Warming

Based on his 40+ years of research and teaching, John Wyngaard's textbook is an excellent up-to-date introduction to turbulence in the atmosphere and in engineering flows for advanced students, and a reference work for researchers in the atmospheric sciences. Part I introduces the concepts and equations of turbulence. It includes a rigorous introduction to the principal types of numerical modeling of turbulent flows. Part II describes turbulence in the atmospheric boundary layer. Part III covers the foundations of the statistical representation of turbulence and includes illustrative examples of stochastic problems that can be solved analytically. The book treats atmospheric and engineering turbulence in a unified way, gives clear explanation of the fundamental concepts of modeling turbulence, and has an up-to-date treatment of turbulence in the atmospheric boundary layer. Student exercises are included at the ends of chapters, and worked solutions are available online for use by course instructors.

Introduction to Physical Chemistry

Understanding the composition and chemistry of the Earth's atmosphere is essential to global ecological and environmental policy making and research. Atmospheric changes as a result of both natural and anthropogenic activity have affected many of the

Earth's natural systems throughout history, some more seriously than others, and such changes are ever more evident with increases in both global warming and extreme weather events. Atmospheric Chemistry considers in detail the physics and chemistry of our atmosphere, that gives rise to our weather systems and climate, soaks up our pollutants and protects us from solar UV radiation. The development of the complex chemistry occurring on Earth can be explained through application of basic principles of physical chemistry, as is discussed in this book. It is therefore accessible to intermediate and advanced undergraduates of chemistry, with an interdisciplinary approach relevant to meteorologists, oceanographers, and climatologists. It also provides an ideal opportunity to bring together many different aspects of physical chemistry and demonstrate their relevance to the world we live in. This book was written in conjunction with Astrochemistry: From the Big Bang to the Present Day, Claire Vallance (2017) World Scientific Publishing. Request Inspection Copy

Atmospheric Thermodynamics

Environmental and Pollution Science, Third Edition, continues its tradition on providing readers with the scientific basis to understand, manage, mitigate, and prevent pollution across the environment, be it air, land, or water. Pollution originates from a wide variety of sources, both natural and man-made, and occurs in a wide variety of forms including, biological, chemical, particulate or even energy, making a multivariate approach to assessment and mitigation essential for

success. This third edition has been updated and revised to include topics that are critical to addressing pollution issues, from human-health impacts to environmental justice to developing sustainable solutions. Environmental and Pollution Science, Third Edition is designed to give readers the tools to be able to understand and implement multi-disciplinary approaches to help solve current and future environmental pollution problems. Emphasizes conceptual understanding of environmental systems and can be used by students and professionals from a diversity of backgrounds focusing on the environment Covers many aspects critical to assessing and managing environmental pollution including characterization, risk assessment, regulation, transport and fate, and remediation or restoration New topics to this edition include Ecosystems and Ecosystem Services, Pollution in the Global System, Human Health Impacts, the interrelation between Soil and Human Health, Environmental Justice and Community Engagement, and Sustainability and Sustainable Solutions Includes color photos and diagrams, chapter questions and problems, and highlighted key words

Fundamentals of Atmospheric Modeling

The study of exoplanetary atmospheres—that is, of planets orbiting stars beyond our solar system—may be our best hope for discovering life elsewhere in the universe. This dynamic, interdisciplinary field requires practitioners to apply knowledge from atmospheric and climate science, astronomy and astrophysics,

chemistry, geology and geophysics, planetary science, and even biology. Exoplanetary Atmospheres provides an essential introduction to the theoretical foundations of this cutting-edge new science. Exoplanetary Atmospheres covers the physics of radiation, fluid dynamics, atmospheric chemistry, and atmospheric escape. It draws on simple analytical models to aid learning, and features a wealth of problem sets, some of which are open-ended. This authoritative and accessible graduate textbook uses a coherent and self-consistent set of notation and definitions throughout, and also includes appendixes containing useful formulae in thermodynamics and vector calculus as well as selected Python scripts. Exoplanetary Atmospheres prepares PhD students for research careers in the field, and is ideal for self-study as well as for use in a course setting. The first graduate textbook on the theory of exoplanetary atmospheres Unifies knowledge from atmospheric and climate science, astronomy and astrophysics, chemistry, planetary science, and more Covers radiative transfer, fluid dynamics, atmospheric chemistry, and atmospheric escape Provides simple analytical models and a wealth of problem sets Includes appendixes on thermodynamics, vector calculus, tabulated Gibbs free energies, and Python scripts Solutions manual (available only to professors)

Chemistry of the Upper and Lower Atmosphere

This revised and updated study is about the atmosphere and humanity's influence on it. Following

an analysis of the natural environment, it re-examines the sources of air pollution and its effects, including decline in health, damage to plants and animals, indoor pollution, and acid rain.

Aquatic Chemistry Concepts, Second Edition

Water in Confining Geometries

Revised and updated in 2000, Basic Physical Chemistry for the Atmospheric Sciences provides a clear, concise grounding in the basic chemical principles required for studies of atmospheres, oceans, and earth and planetary systems. Undergraduate and graduate students with little formal training in chemistry can work through the chapters and the numerous exercises within this book before accessing the standard texts in the atmospheric chemistry, geochemistry, and the environmental sciences. The book covers the fundamental concepts of chemical equilibria, chemical thermodynamics, chemical kinetics, solution chemistry, acid and base chemistry, oxidation-reduction reactions, and photochemistry. In a companion volume entitled Introduction to Atmospheric Chemistry (2000, Cambridge University Press) Peter Hobbs provides an introduction to atmospheric chemistry itself, including its applications to air pollution, acid rain, the ozone hole, and climate change. Together these two books provide an ideal introduction to atmospheric chemistry for a variety of

disciplines.