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This original text develops a deep, conceptual understanding of thermal physics and highlights the important links between statistical physics and classical thermodynamics. It examines how thermal physics fits within physics as a whole, and is perfect for undergraduate and graduate students, and researchers interested in a fresh approach to the subject. Both a comprehensive overview and a treatment at the appropriate level of detail, this textbook explains thermodynamics and generalizes the subject so it can be applied to small nano- or biosystems, arbitrarily far from or close to equilibrium. In addition, nonequilibrium free energy theorems are covered with a rigorous exposition of each one. Throughout, the authors stress the physical concepts along with the mathematical derivations. For researchers and students in physics, chemistry, materials science and molecular biology, this is a useful text for postgraduate courses in statistical mechanics, thermodynamics and molecular simulations, while equally serving as a reference for university teachers and researchers in these fields. This textbook presents a concise yet detailed introduction to quantum physics. Concise, because it condenses the essentials to a few principles. Detailed, because these few principles – necessarily rather abstract – are illustrated by several telling examples. A fairly complete overview of the conventional quantum mechanics curriculum is the primary focus, but the huge field of statistical thermodynamics is covered as well. The text explains why a few key discoveries shattered the prevailing broadly accepted classical view of physics. First, matter appears to consist of particles which, when propagating, resemble waves. Consequently, some observable properties cannot be measured simultaneously with arbitrary precision. Second, events with single particles are not determined, but are more or less probable. The essence of this is that the observable properties of a physical system are to be represented by non-commuting mathematical objects instead of real numbers. Chapters on exceptionally simple, but highly instructive examples illustrate this abstract formulation of quantum physics. The simplest atoms, ions, and molecules are explained, describing their interaction with electromagnetic radiation as well as the scattering of particles. A short introduction to many particle physics with an outlook on quantum fields follows. There is a chapter on maximally mixed states of very large systems, that is statistical thermodynamics. The following chapter on the linear response to perturbations provides a link to the material equations of continuum physics. Mathematical details which would hinder the flow of the main text

have been deferred to an appendix. The book addresses university students of physics and related fields. It will attract graduate students and professionals in particular who wish to systematize or refresh their knowledge of quantum physics when studying specialized texts on solid state and materials physics, advanced optics, and other modern fields. Statistical thermodynamics plays a vital linking role between quantum theory and chemical thermodynamics, yet students often find the subject unpalatable. In this updated version of a popular text, the authors overcome this by emphasising the concepts involved, in particular demystifying the partition function. They do not get bogged down in the mathematical niceties that are essential for a profound study of the subject but which can confuse the beginner. Strong emphasis is placed on the physical basis of statistical thermodynamics and the relations with experiment. After a clear exposition of the distribution laws, partition functions, heat capacities, chemical equilibria and kinetics, the subject is further illuminated by a discussion of low-temperature phenomena and spectroscopy. The coverage is brought right up to date with a chapter on computer simulation and a final section which ranges beyond the narrow limits usually associated with student texts to emphasise the common dependence of macroscopic behaviour on the properties of constituent atoms and molecules. Since first published in 1974 as 'Entropy and Energy Levels', the book has been very popular with students. This revised and updated version will no doubt serve the same needs. Learn classical thermodynamics alongside statistical mechanics and how macroscopic and microscopic ideas interweave with this fresh approach to the subjects. This introductory textbook for standard undergraduate courses in thermodynamics has been completely rewritten to explore a greater number of topics, more clearly and concisely. Starting with an overview of important quantum behaviours, the book teaches students how to calculate probabilities in order to provide a firm foundation for later chapters. It introduces the ideas of classical thermodynamics and explores them both in general and as they are applied to specific processes and interactions. The remainder of the book deals with statistical mechanics. Each topic ends with a boxed summary of ideas and results, and every chapter contains numerous homework problems, covering a broad range of difficulties. Answers are given to odd-numbered problems, and solutions to even-numbered problems are available to instructors at www.cambridge.org/9781107694927. Clearly connects macroscopic and microscopic thermodynamics and explains non-equilibrium behavior in kinetic theory and chemical kinetics. This 2006 textbook discusses the fundamentals and applications of statistical thermodynamics for beginning graduate students in the physical and engineering sciences. Building on the prototypical Maxwell-Boltzmann method and maintaining a step-by-step development of the subject, this book assumes the reader has no previous exposure to statistics, quantum mechanics or spectroscopy. The book begins with the essentials of statistical thermodynamics, pauses to recover needed knowledge from quantum mechanics and spectroscopy, and then moves on to applications involving ideal gases, the solid state and radiation. A full introduction to kinetic theory is provided, including its applications to transport phenomena and chemical kinetics. A highlight of the textbook is its discussion of modern applications, such as laser-based diagnostics. The book concludes with a thorough presentation of the ensemble method, featuring its use for real gases. Numerous examples and prompted homework problems enrich the text. Detailed development of the statistical basis of nonequilibrium thermodynamics, based on the mathematical theory of Brownian motion. Unifying approach permits extraction of widely applicable principles from models. 1985 edition. Volume 5. A comprehensive introduction to this important subject, presenting the fundamentals of classical and statistical thermodynamics through carefully developed concepts which are supported by many examples and applications. * Each chapter includes numerous carefully worked out examples and problems * Takes a more applied approach rather than theoretical * Necessary mathematics is left simple * Accessible to those fairly new to the subject

Lectures on Theoretical Physics, Volume V: Thermodynamics and Statistical Mechanics discusses the significant developments and problems in the study of thermodynamics and statistical mechanics. This volume contains five chapters. The first two chapters provide an overview of the various aspects and applications of thermodynamics. Chapter III contains a preliminary introduction to statistical mechanics, with an emphasis on the Brownian motion, which is the most important example of statistical fluctuations. Chapter IV describes the Boltzmann's original form of combinatorial method, in which the molecules of a gas are endowed with a physically real existence. This chapter also considers the various numerical combinations that govern the way in which the mutually indistinguishable particles are distributed over the states constituting the substance of the statistics. Chapter V explores the behavior of molecules in perfect gases following the course of historical development. This chapter covers an exact formulation of the kinetic theory of gases. Physics teachers and students will find this book invaluable. Encompassing essentially all aspects of statistical mechanics that appear in undergraduate texts, this concise, elementary treatment shows how an atomic-molecular perspective yields new insights into macroscopic thermodynamics. 1974 edition. This textbook facilitates students' ability to apply fundamental principles and concepts in classical thermodynamics to solve challenging problems relevant to industry and everyday life. It also introduces the reader to the fundamentals of statistical mechanics, including understanding how the microscopic properties of atoms and molecules, and their associated intermolecular interactions, can be accounted for to calculate various average properties of macroscopic systems. The author emphasizes application of the fundamental principles outlined above to the calculation of a variety of thermodynamic properties, to the estimation of conversion efficiencies for work production by heat interactions, and to the solution of practical thermodynamic problems related to the behavior of non-ideal pure fluids and fluid mixtures, including phase equilibria and chemical reaction equilibria. The book contains detailed solutions to many challenging sample problems in classical thermodynamics and statistical mechanics that will help the reader crystallize the material taught. Class-tested and perfected over 30 years of use by nine-time Best Teaching Award recipient Professor Daniel Blankshtein of the Department of Chemical Engineering at MIT, the book is ideal for students of Chemical and Mechanical Engineering, Chemistry, and Materials Science, who will benefit greatly from in-depth discussions and pedagogical explanations of key concepts. Distills critical concepts, methods, and applications from leading full-length textbooks, along with the author's own deep understanding of the material taught, into a concise yet rigorous graduate and advanced undergraduate text; Enriches the standard curriculum with succinct, problem-based learning strategies derived from the content of 50 lectures given over the years in the Department of Chemical Engineering at MIT; Reinforces concepts covered with detailed solutions to illuminating and challenging homework problems. This text presents statistical mechanics and thermodynamics as a theoretically integrated field of study. It stresses deep coverage of fundamentals, providing a natural foundation for advanced topics. The large problem sets (with solutions for teachers) include many computational problems to advance student understanding. A thorough exploration of the universal principles of thermodynamics and statistical mechanics, this volume takes an applications-oriented approach to a multitude of situations arising in physics and engineering. 1987 edition. Exceptionally articulate treatment of negative temperatures, relativistic effects, black hole thermodynamics, gravitational collapse, much more. Over 100 problems with worked solutions. Geared toward advanced undergraduates and graduate students. From the reviews: "This book excels by its variety of modern examples in solid state physics, magnetism, elementary particle physics [...] I can recommend it strongly as a valuable source, especially to those who are teaching basic statistical physics at our universities." Physicalia This text aims to help students understand energy, its different forms and transformations, and the key role of entropy, as applied to chemical systems. Nobel laureate's brilliant attempt to develop a simple, unified standard method of dealing with all cases of statistical thermodynamics — classical, quantum, Bose-Einstein, Fermi-Dirac, and more. The work also includes discussions of Nernst theorem, Planck's oscillator, fluctuations, the n-particle problem, problem of radiation, and much more. This book provides a comprehensive exposition of the theory of equilibrium thermodynamics and statistical mechanics at a level suitable for well-prepared undergraduate students. The fundamental message of the book is that all results in equilibrium thermodynamics and statistical mechanics follow from a single unprovable axiom — namely, the principle of equal a priori probabilities — combined with elementary probability theory, elementary classical mechanics, and elementary quantum mechanics. Lack of understanding of the First law is often responsible for difficulty using the Second Law. If the concept of thermodynamic temperature is properly

understood, the full meaning of the Second law is easy to grasp intuitively as that of the first, if not easier. The account of thermodynamics and statistical mechanics in *Thermodynamics and Statistical Mechanics* is based on entropy and its maximization. Building from first principles, it gives a transparent explanation of the physical behaviour of equilibrium thermodynamic systems, and it presents a comprehensive, self-contained account of the modern mathematical and computational techniques of statistical mechanics. This field of study is of vital importance to researchers, lecturers and students alike. Dr Attard is a well-known researcher in statistical mechanics who has made significant contributions to this field. His book offers a fresh perspective on the foundations of statistical thermodynamics. It includes a number of new results and novel derivations, and provides an intriguing alternative to existing monographs. Especially of note are the simple graphs and figures that illustrate the text throughout and the logical organization of the material. *Thermodynamics and Statistical Mechanics* will be an invaluable and comprehensive reference manual for research scientists. This text can be used as a complement to existing texts and for supplementary reading. Offers a fresh perspective on the foundations of statistical thermodynamics. Includes a number of new results and novel derivations, and provides an intriguing alternative to existing monographs. Simple graphs and figures illustrate the text throughout. Logical organization of material. An invaluable and comprehensive reference manual for research scientists. Can be used as a complement to existing texts and for supplementary reading. This loose-leaf, three-hole punched version of the textbook gives students the flexibility to take only what they need to class and add their own notes--all at an affordable price. For courses in Thermodynamics. A visual, conceptual and contemporary approach to Physical Chemistry. Engel and Reid's *Thermodynamics, Statistical Thermodynamics, and Kinetics* provides a contemporary, conceptual, and visual introduction to physical chemistry. The authors emphasize the vibrancy of physical chemistry today and illustrate its relevance to the world around us, using modern applications drawn from biology, environmental science, and material science. The 4th Edition provides visual summaries of important concepts and connections in each chapter, offers students "just-in-time" math help, and expands content to cover science relevant to physical chemistry. Tutorials in Mastering(TM) Chemistry reinforce students' understanding of complex theory in Quantum Chemistry and Thermodynamics as they build problem-solving skills throughout the course. Also available with Mastering Chemistry. Mastering(TM) is the teaching and learning platform that empowers you to reach every student. By combining trusted author content with digital tools developed to engage students and emulate the office-hour experience, Mastering personalizes learning and often improves results for each student. Instructors ensure students arrive ready to learn by assigning educationally effective content before class, and encourage critical thinking and retention with in-class resources such as Learning Catalytics. Learn more about Mastering Chemistry. NOTE: You are purchasing a standalone product; Mastering(TM) Geography does not come packaged with this content. Students, if interested in purchasing this title with Mastering Geography, ask your instructor to confirm 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 Geography, search for: 0134813790 / 9780134813790 Physical Chemistry: Thermodynamics, Statistical Thermodynamics, and Kinetics, Books a la Carte Plus MasteringChemistry with Pearson eText -- Access Card Package, 4/e "A large number of exercises of a broad range of difficulty make this book even more useful... a good addition to the literature on thermodynamics at the undergraduate level." — *Philosophical Magazine* Although written on an introductory level, this wide-ranging text provides extensive coverage of topics of current interest in equilibrium statistical mechanics. Indeed, certain traditional topics are given somewhat condensed treatment to allow room for a survey of more recent advances. The book is divided into four major sections. Part I deals with the principles of quantum statistical mechanics and includes discussions of energy levels, states and eigenfunctions, degeneracy and other topics. Part II examines systems composed of independent molecules or of other independent subsystems. Topics range from ideal monatomic gas and monatomic crystals to polyatomic gas and configuration of polymer molecules and rubber elasticity. An examination of systems of interacting molecules comprises the nine chapters in Part III, reviewing such subjects as lattice statistics, imperfect gases and dilute liquid solutions. Part IV covers quantum statistics and includes sections on Fermi-Dirac and Bose-Einstein statistics, photon gas and free-volume theories of quantum liquids. Each chapter includes problems varying in difficulty — ranging from simple numerical exercises to small-scale "research" propositions. In addition, supplementary reading lists for each chapter invite students to pursue the subject at a more advanced level. Readers are assumed to have studied thermodynamics, calculus, elementary differential equations and elementary quantum mechanics. Because of the flexibility of the chapter arrangements, this book especially lends itself to use in a one- or two-semester graduate course in chemistry, a one-semester senior or graduate course in physics or an introductory course in statistical mechanics. This book provides a solid introduction to the classical and statistical theories of thermodynamics while assuming no background beyond general physics and advanced calculus. Though an acquaintance with probability and statistics is helpful, it is not necessary. Providing a thorough, yet concise treatment of the phenomenological basis of thermal physics followed by a presentation of the statistical theory, this book presupposes no exposure to statistics or quantum mechanics. It covers several important topics, including a mathematically sound presentation of classical thermodynamics; the kinetic theory of gases including transport processes; and thorough, modern treatment of the thermodynamics of magnetism. It includes up-to-date examples of applications of the statistical theory, such as Bose-Einstein condensation, population inversions, and white dwarf stars. And, it also includes a chapter on the connection between thermodynamics and information theory. Standard International units are used throughout. An important reference book for every professional whose work requires an understanding of thermodynamics: from engineers to industrial designers. Extensively revised edition of a much-respected work examines thermodynamics of irreversible processes, general principles of statistical thermodynamics, assemblies of noninteracting structureless particles, and statistical theory. 1966 edition. This text is a major revision of *An Introduction to Thermodynamics, Kinetic Theory, and Statistical Mechanics* by Francis Sears. The general approach has been unaltered and the level remains much the same, perhaps being increased somewhat by greater coverage. The text is particularly useful for advanced undergraduates in physics and engineering who have some familiarity with calculus. This book provides an interwoven development of classical and statistical thermodynamic principles from a modern perspective. "This textbook addresses the key questions in both classical thermodynamics and statistical thermodynamics: Why are the thermodynamic properties of a nano-sized system different from those of a macroscopic system of the same substance? Why and how is entropy defined in thermodynamics, and how is the entropy change calculated when dissipative heat is involved? What is an ensemble and why is its theory so successful?" "Translated from a highly successful Chinese book, this expanded English edition contains many updated sections and several new ones. They include the introduction of the grand canonical ensemble, the grand partition function and its application to ideal quantum gases, a discussion of the mean field theory of the Ising model and the phenomenon of ferromagnetism, as well as a more detailed discussion of ideal quantum gases near $T = 0$, for both Fermi and Bose gases." --BOOK JACKET. This textbook provides comprehensive information on general and statistical thermodynamics. It begins with an introductory statistical mechanics course, deriving all the important formulae meticulously and explicitly, without mathematical shortcuts. In turn, the main part of the book focuses on in-depth discussions of the concepts and laws of thermodynamics, van der Waals, Kelvin and Clausius theories, ideal and real gases, thermodynamic potentials, phonons and all related aspects. To elucidate the concepts introduced and to provide practical problem-solving support, numerous carefully worked-out examples are included. The text is clearly written and punctuated with a number of interesting anecdotes. The book also provides alternative solutions to problems and second equivalent explanations of important physical concepts. This second edition has been expanded to cover the foundations of superconductivity with new chapters on Cooper pairs, the Bogoliubov transformation, and superconductivity. It is suitable as a main thermodynamics textbook for upper-undergraduate students and provides extensive coverage, allowing instructors to 'pick and choose' the elements that best match their class profile. Statistical thermodynamics and the related domains of statistical

physics and quantum mechanics are very important in many fields of research, including plasmas, rarefied gas dynamics, nuclear systems, lasers, semiconductors, superconductivity, ortho- and para-hydrogen, liquid helium, and so on. *Statistical Thermodynamics: Understanding the Properties of Macroscopic Systems* provides a detailed overview of how to apply statistical principles to obtain the physical and thermodynamic properties of macroscopic systems. Intended for physics, chemistry, and other science students at the graduate level, the book starts with fundamental principles of statistical physics, before diving into thermodynamics. Going further than many advanced textbooks, it includes Bose-Einstein, Fermi-Dirac statistics, and Lattice dynamics as well as applications in polaron theory, electronic gas in a magnetic field, thermodynamics of dielectrics, and magnetic materials in a magnetic field. The book concludes with an examination of statistical thermodynamics using functional integration and Feynman path integrals, and includes a wide range of problems with solutions that explain the theory. Four-part treatment covers principles of quantum statistical mechanics, systems composed of independent molecules or other independent subsystems, and systems of interacting molecules, concluding with a consideration of quantum statistics. This textbook concerns thermal properties of bulk matter and is aimed at advanced undergraduate or first-year graduate students in a range of programs in science or engineering. It provides an intermediate level presentation of statistical thermodynamics for students in the physical sciences (chemistry, nanosciences, physics) or related areas of applied science/engineering (chemical engineering, materials science, nanotechnology engineering), as they are areas in which statistical mechanical concepts play important roles. The book enables students to utilize microscopic concepts to achieve a better understanding of macroscopic phenomena and to be able to apply these concepts to the types of sub-macroscopic systems encountered in areas of nanoscience and nanotechnology.

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