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Topics in Atomic Physics Vol 29: Atoms: Adaptive Problems Book in Physics (with Detailed Solutions) for College & High School *Chaos in Atomic Physics* The Physics of Atoms and Quanta *Computational Atomic Physics Quantum Physics of Light and Matter* **Zero-Range Potentials and Their Applications in Atomic Physics** *Advances in Atomic Physics* **Atomic Physics** *Modern Physics* **Modern Atomic and Nuclear Physics** *Atomic, Molecular, and Optical Physics: Charged Particles* Computational Atomic Physics **Variational Methods in Electron-Atom Scattering Theory** *Atoms and Light: Interactions* **Physics of Atoms and Ions** Physics of Atoms and Molecules *Theoretical Atomic Physics* **Atom Optics Physics of Atomic Nuclei** Niels Bohr **Atomic and Nuclear Physics Collisions of Electrons with Atoms and Molecules Basic Physics of Atoms and Molecules** *1000 Solved Problems in Modern Physics Nuclear and Particle Physics* Astronomy-Inspired Atomic and Molecular Physics *The Physics of Atoms and Quanta* **Light-Matter Interaction Atomic Physics Structure and Collisions of Ions and Atoms** *Atoms, Radiation, and Radiation Protection Many-Body Atomic Physics* Scattering Theory of Molecules, Atoms, and Nuclei **Polarization, Alignment, and Orientation in Atomic Collisions Atomic Astrophysics and Spectroscopy** Atomic and Molecular Physics *Theoretical Femtosecond Physics* **The History and Science of the Manhattan Project** *Atomic and Free Electrons in a Strong Light Field*

Learn Atoms which is divided into various sub topics. Each topic has plenty of problems in an adaptive difficulty wise. From basic to advanced level with gradual increment in the level of difficulty. The set of problems on any topic almost covers all varieties of physics problems related to the chapter Atomic Structure. If you are preparing for IIT JEE Mains and Advanced or NEET or CBSE Exams, this Physics eBook will really help you to master this chapter completely in all aspects. It is a Collection of Adaptive Physics Problems in Atoms structure for SAT Physics, AP Physics, 11 Grade Physics, IIT JEE

Mains and Advanced , NEET & Olympiad Level Book Series Volume 29 This Physics eBook will cover following Topics for Atoms: 1. Old Atomic Models 2. Rutherford Model 3. Niels Bohr Model 4. State Change & Transition Problems 5. Energy Series 6. Miscellaneous Problems 7. Chapter Test The intention is to create this book to present physics as a most systematic approach to develop a good numerical solving skill. About Author Satyam Sir has graduated from IIT Kharagpur in Civil Engineering and has been teaching Physics for JEE Mains and Advanced for more than 8 years. He has mentored over ten thousand students and continues mentoring in regular classroom coaching. The students from his class have made into IIT institutions including ranks in top 100. The main goal of this book is to enhance problem solving ability in students. Sir is having hope that you would enjoy this journey of learning physics! In case of query, visit www.physicsfactor.com or WhatsApp to our customer care number +91 7618717227 The present edition of the book is revised as per the UGC syllabus.Questions and problems at the end of each chapter have been up-dated.Many new solved examples are included in this edition.Certain topic have been added so that students from some universities where the syllabus has been modified and upgraded may benefit.Besides being a text book we hope that this benifit students appearing at the IAS,AMIE and other Competitive Examinations. Computational Atomic Physics deals with computational methods for calculating electron (and positron) scattering from atoms and ions, including elastic scattering, excitation, and ionization processes. Each chapter is divided into abstract, theory, computer program with sample input and output, summary, suggested problems, and references. An MS-DOS diskette is included, which holds 11 programs covering the features of each chapter and therefore contributing to a deeper understanding of the field. Thus the book provides a unique practical application of advanced quantum mechanics. This textbook extends from the basics of femtosecond physics all the way to some of the latest developments in the field. In this updated edition, the chapter on laser-driven atoms is augmented by the discussion of two-electron atoms interacting with strong and short laser pulses, as well as by a review of ATI rings and low energy structures in photo-electron spectra. In the chapter on laser-driven molecules a discussion of 2D infrared

spectroscopy is incorporated. Theoretical investigations of atoms and molecules interacting with pulsed lasers up to atomic field strengths on the order of 10^16 W/cm2 are leading to an understanding of many challenging experimental discoveries. The presentation starts with a brief introduction to pulsed laser physics. The basis for the non-perturbative treatment of laser-matter interaction in the book is the time-dependent Schr ö dinger equation. Its analytical as well as numerical solution are laid out in some detail. The light field is treated classically and different possible gauges for the field-matter interaction are discussed. Physical phenomena, ranging from paradigmatic Rabi-oscillations in two-level systems to the ionization of atoms, the generation of high-order harmonics, the ionization and dissociation of molecules, as well as the control of chemical reactions are presented and discussed on a fundamental level. In this way, the theoretical background for state of the art experiments with strong and short laser pulses is given. The new text is augmented by several additional exercises and now contains a total of forty-eight problems, whose worked-out solutions are given in the last chapter. In addition, some detailed calculations are performed in the appendices. Furthermore, each chapter ends with references to more specialized literature. Atoms, Radiation, and Radiation Protection offers professionals and advanced students a comprehensive coverage of the major concepts that underlie the origins and transport of ionizing radiation in matter. Understanding atomic structure and the physical mechanisms of radiation interactions is the foundation on which much of the current practice of radiological health protection is based. The work covers the detection and measurement of radiation and the statistical interpretation of the data. The procedures that are used to protect man and the environment from the potential harmful effects of radiation are thoroughly described. Basic principles are illustrated with an abundance of worked examples that exemplify practical applications. Chapters include problem sets (with partial answers) and extensive tables and graphs for continued use as a reference work. This completely revised and enlarged third edition includes thorough updates of the material, including the latest recommendations of the ICRP and NCRP. Atomic Physics provides a concise treatment of atomic physics and a basis to prepare for work in other disciplines that are underpinned by atomic physics such as chemistry, biology

and several aspects of engineering science. The focus is mainly on atomic structure since this is what is primarily responsible for the physical properties of atoms. After a brief introduction to some basic concepts, the perturbation theory approach follows the hierarchy of interactions starting with the largest. The other interactions of spin, and angular momentum of the outermost electrons with each other, the nucleus and external magnetic fields are treated in order of descending strength. A spectroscopic perspective is generally taken by relating the observations of atomic radiation emitted or absorbed to the internal energy levels involved. X-ray spectra are then discussed in relation to the energy levels of the innermost electrons. Finally, a brief description is given of some modern, laser based, spectroscopic methods for the high resolution study of the nest details of atomic structure. This book draws together the principal ideas that form the basis of atomic, molecular, and optical science and engineering. It covers the basics of atoms, diatomic molecules, atoms and molecules in static and electromagnetic fields and nonlinear optics. Exercises and bibliographies supplement each chapter, while several appendices present such important background information as physics and math definitions, atomic and molecular data, and tensor algebra. Accessible to advanced undergraduates, graduate students, or researchers who have been trained in one of the conventional curricula of physics, chemistry, or engineering but who need to acquire familiarity with adjacent areas in order to pursue their research goals. This book presents a comprehensive overview of the spectacular advances seen in atomic physics during the last 50 years. The authors explain how such progress was possible by highlighting connections between developments that occurred at different times. They discuss the new perspectives and the new research fields that look promising. The emphasis is placed, not on detailed calculations, but rather on physical ideas. Combining both theoretical and experimental considerations, the book will be of interest to a wide range of students, teachers and researchers in quantum and atomic physics. The development of atomic bombs under the auspices of the U.S. Army ' s Manhattan Project during World War II is considered to be the outstanding news story of the twentieth century. In this book, a physicist and expert on the history of the Project presents a comprehensive overview of this momentous achievement. The first three chapters cover the history of nuclear

physics from the discovery of radioactivity to the discovery of fission, and would be ideal for instructors of a sophomore-level " Modern Physics " course. Student-level exercises at the ends of the chapters are accompanied by answers. Chapter 7 covers the physics of first-generation fission weapons at a similar level, again accompanied by exercises and answers. For the interested layman and for non-science students and instructors, the book includes extensive qualitative material on the history, organization, implementation, and results of the Manhattan Project and the Hiroshima and Nagasaki bombing missions. The reader also learns about the legacy of the Project as reflected in the current world stockpiles of nuclear weapons. This second edition contains important revisions and additions, including a new chapter on the German atomic bomb program and new sections on British and Canadian contributions to the Manhattan project and on feed materials. Several other sections have been expanded; reader feedback has been helpful in introducing minor corrections and improved explanations; and, last but not least, the second edition includes a detailed index. Problems after each chapter This book is targeted mainly to the undergraduate students of USA, UK and other European countries, and the M. Sc of Asian countries, but will be found useful for the graduate students, Graduate Record Examination (GRE), Teachers and Tutors. This is a by-product of lectures given at the Osmania University, University of Ottawa and University of Tebrez over several years, and is intended to assist the students in their assignments and examinations. The book covers a wide spectrum of disciplines in Modern Physics, and is mainly based on the actual examination papers of UK and the Indian Universities. The selected problems display a large variety and conform to syllabi which are currently being used in various countries. The book is divided into ten chapters. Each chapter begins with basic concepts containing a set of formulae and explanatory notes for quick reference, followed by a number of problems and their detailed solutions. The problems are judiciously selected and are arranged section-wise. The so- tions are neither pedantic nor terse. The approach is straight forward and step-- step solutions are elaborately provided. More importantly the relevant formulas used for solving the problems can be located in the beginning of each chapter. There are approximately 150 line diagrams for illustration. Basic quantum mechanics, elementary calculus,

vector calculus and Algebra are the pre-requisites. This book presents and describes a series of unusual and striking strong-field phenomena concerning atoms and free electrons. Some of these phenomena are: multiphoton stimulated bremsstrahlung, free-electron lasers, wave-packet physics, above-threshold ionization, and strong-field stabilization in Rydberg atoms. The theoretical foundations and causes of the phenomena are described in detail, with all the approximations and derivations discussed. All the known and relevant experiments are described too, and their results are compared with those of the existing theoretical models.An extensive general theoretical introduction gives a good basis for subsequent parts of the book and is an independent and self-sufficient description of the most efficient theoretical methods of the strong-field and multiphoton physics. This book can serve as a textbook for graduate students. This advanced textbook presents an extensive and diverse study of low-energy nuclear physics considering the nucleus as a quantum system of strongly interacting constituents. The contents guide students from the basic facts and ideas to more modern topics including important developments over the last 20 years, resulting in a comprehensive collection of major modern-day nuclear models otherwise unavailable in the current literature. The book emphasizes the common features of the nucleus and other many-body mesoscopic systems currently in the center of interest in physics. The authors have also included full problem sets that can be selected by lecturers and adjusted to specific interests for more advanced students, with many chapters containing links to freely available computer code. As a result, readers are equipped for scientific work in mesoscopic physics. This introduction to the field of many-body atomic physics is suitable for researchers and graduate students. Drawing from three major subject areas, atomic structure, atomic photoionization, and electron-atom collisions, this book begins with an introduction to many-body diagrams, and continues with several chapters devoted to each subject area written by leading theorists in that field. Topics in atomic structure include the relativistic theory for highly charged atomic ions and calculations of parity nonconservation. Topics in atomic photoionization include single and double photoionization processes, and photoelectron angular distributions. Topics in electron-atom collisions include the theory of electron impact ionization, perturbation series methods,

target dependence of the triply differential cross section, Thomas processes, R-matrix theory, close coupling, and distorted-wave theory. This coherent and carefully edited volume has been prepared by leading atomic physicists as a tribute to Hugh Kelly, one of the pioneers of many-body theory. The importance of the ?eld of atomic physics to modern technology cannot be overemphasized. Atomic physics served as a major impetus to the development of the quantum theory of matter in the early part of the twentieth century and, due to the availability of the laser as a laboratory tool, it has taken us into the twen- ?rst century with an abundance of new and exciting phenomena to understand. Our intention in writing this book is to provide a foundation for students to begin researchinmodernatomicphysics. Asthetitleimplies,itisnot,norwasitintended to be, an all-inclusive tome covering every aspect of atomic physics. Any specialized textbook necessarily re?ects the predilection of the authors toward certain aspects of the subject. This one is no exception. It re?ects our - lief that a thorough understanding of the unique properties of the hydrogen atom is essential to an understanding of atomic physics. It also re?ects our fasci- tion with the distinguished position that Mother Nature has bestowed on the pure Coulomb and Newtonian potentials, and thus hydrogen atoms and Keplerian - bits. Therefore, we have devoted a large portion of this book to the hydrogen atom toemphasizethisdistinctiveness. Weattempttostresstheuniquenessoftheattr- tive 1/r potential without delving into group theory. It is our belief that, once an understanding of the hydrogen atom is achieved, the properties of multielectron atoms can be understood as departures from hydrogenic properties. The study of atomic and molecular physics is a key component of undergraduate courses in physics, because of its fundamental importance to the understanding of many aspects of modern physics. The aim of this new edition is to provide a unified account of the subject within an undergraduate framework, taking the opportunity to make improvements based on the teaching experience of users of the first edition, and cover important new developments in the subject. Updated and expanded edition of this well-known Physics textbook provides an excellent Undergraduate introduction to the field This new edition of Nuclear and Particle Physics continues the standards established by its predecessors, offering a comprehensive and highly

readable overview of both the theoretical and experimental areas of these fields. The updated and expanded text covers a very wide range of topics in particle and nuclear physics, with an emphasis on the phenomenological approach to understanding experimental data. It is one of the few publications currently available that gives equal treatment to both fields, while remaining accessible to undergraduates. Early chapters cover basic concepts of nuclear and particle physics, before describing their respective phenomenologies and experimental methods. Later chapters interpret data through models and theories, such as the standard model of particle physics, and the liquid drop and shell models of nuclear physics, and also discuss many applications of both fields. The concluding two chapters deal with practical applications and outstanding issues, including extensions to the standard model, implications for particle astrophysics, improvements in medical imaging, and prospects for power production. There are a number of useful appendices. Other notable features include: New or expanded coverage of developments in relevant fields, such as the discovery of the Higgs boson, recent results in neutrino physics, research to test theories beyond the standard model (such as supersymmetry), and important technical advances, such as Penning traps used for high-precision measurements of nuclear masses. Practice problems at the end of chapters (excluding the last chapter) with solutions to selected problems provided in an appendix, as well as an extensive list of references for further reading. Companion website with solutions (odd-numbered problems for students, all problems for instructors), PowerPoint lecture slides, and other resources. As with previous editions, the balanced coverage and additional resources provided, makes Nuclear and Particle Physics an excellent foundation for advanced undergraduate courses, or a valuable general reference text for early graduate studies. After a brief review of quantum mechanics and a summary of conventional atomic theory, H. Friedrich discusses the structure of atomic spectra on the basis of quantum defect theory, which is treated for the first time at such a basic level in a textbook. Special attention is given to highly excited states and to the influence of external fields, which can cause intricate and interesting effects in seemingly simple systems. After a chapter on reaction theory the final chapter treats special topics such as multiphoton absorption and chaos. The book contains the kind of advanced

quantum mechanics needed for practical applications in modern atomic physics. The presentation is kept deliberately simple and avoids abstract formalism as far as possible. Quantum mechanics does away with the distinction between particles and waves, and one of the more interesting implications of the wave/particle duality - the discovery that atoms may be manipulated in ways analogous to the manipulation of light with lenses and mirrors - has formed the basis for the relatively new field of atom optics. Pierre Meystre's Atom Optics is the first book entirely devoted to this exciting area of research. Reference links to the leading journals in the field, links to research sites, graphics, and updates can be found online. "Spectroscopy enables the precise study of astronomical objects and phenomena. Bridging the gap between physics and astronomy, this is the first integrated graduate-level textbook on atomic astrophysics. It covers the basics of atomic physics and astrophysics, including state-of-the-art research applications, methods and tools. The content is evenly balanced between the physical foundations of spectroscopy and their applications to astronomical objects and cosmology. An undergraduate knowledge of physics is assumed, and relevant basic material is summarised at the beginning of each chapter. The material is completely self-contained and features sufficient background information for self-study. Advanced users will find it handy for spectroscopic studies. A website hosted by the authors contains updates, corrections, exercises and solutions, as well as news items from physics and astronomy related to spectroscopy. A link to this can be found at www.cambridge.org/9780521825368"--. "The text is evenly divided into atomic physics and astrophysics. The first seven chapters form the foundational elements of atomic processes and spectroscopy. The next seven chapters deal with astrophysical applications to specific objects and physical conditions. Each chapter follows the same plan. We begin with the essentials that all readers should be able to follow easily. However, towards the end of each chapter we outline some of the more advanced or specialized areas. The subject matter is broadly divided into 'basic' material in both areas, and 'advanced' material that incorporates state-of-the-art methods and results"-- This book discusses the interaction of light with atoms, concentrating on the semiclassical descriptions of the processes. It begins by discussing the classical theory of electromagnetic radiation and its interaction with a classical charged

dipole oscillator. Then, in a pivotal chapter, the interaction with a free charge is described (the Compton effect); it is shown that, in order to give agreement with observation, certain quantum rules must be introduced. The book then proceeds to discuss the interaction from this point of view-light always being described classically, atoms described quantum-mechanically, with quantum rules for the interaction. Subsequent chapters deal with stimulated emission and absorption, spontaneous emission and decay, the general problem of light stimulating and being scattered from the two-state atom, the photoelectric effect, and photoelectric counting statistics. Finally the author gives a personal view on the nature of light and his own way of looking at certain paradoxes. The writing of this book was originally conceived as a collaboration between the present author and a colleague of former years, Alan V. Durrant. Indeed, some preliminary exchange of ideas took place in the mid-1970s. But the problems of joint-authorship from antipodean positions proved too difficult and the project was abandoned. I would like to record my indebted ness to him for the stimulation of this early association. I also acknowledge the encouragement of my colleagues at the Univer sity of Otago. Special reference must be made to D. M. With this volume, Methods of Experimental Physics becomes Experimental Methods in the Physical Sciences, a name change which reflects the evolution of todays science. This volume is the first of three which will provide a comprehensive treatment of the key experimental methods of atomic, molecular, and optical physics; the three volumes as a set will form an excellent experimental handbook for the field. The wide availability of tunable lasers in the pastseveral years has revolutionized the field and lead to the introduction of many new experimental methods that are covered in these volumes. Traditional methods are also included to ensure that the volumes will be a complete reference source for the field. The book gives an introduction to the field quantization (second quantization) of light and matter with applications to atomic physics. The first chapter briefly reviews the origins of special relativity and quantum mechanics and the basic notions of quantum information theory and quantum statistical mechanics. The second chapter is devoted to the second quantization of the electromagnetic field, while the third chapter shows the consequences of the light field quantization in the description of electromagnetic transitions. In the fourth

chapter it is analyzed the spin of the electron, and in particular its derivation from the Dirac equation, while the fifth chapter investigates the effects of external electric and magnetic fields on the atomic spectra (Stark and Zeeman effects). The sixth chapter describes the properties of systems composed by many interacting identical particles by introducing the Hartree-Fock variational method, the density functional theory and the Born-Oppenheimer approximation. Finally, in the seventh chapter it is explained the second quantization of the non-relativistic matter field, i.e. the Schrodinger field, which gives a powerful tool for the investigation of many-body problems and also atomic quantum optics. At the end of each chapter there are several solved problems which can help the students to put into practice the things they learned. This book describes atomic physics and the latest advances in this field at a level suitable for fourth year undergraduates. The numerous examples of the modern applications of atomic physics include Bose-Einstein condensation of atoms, matter-wave interferometry and quantum computing with trapped ions. The central subject of this volume is the atomic and molecular physics of heavy par ticles as investigated with charged particle accelerators. The natural division be tween atomic structure and ion-atom collision studies, and the similar division be tween the theoretical and experimental branches of these subjects, are reflected in a parallel subdivision into corresponding chapters. In addition, one chapter is de voted to the important interface between atomic and molecular physics with condensed matter physics. A principal aim of the present volume is to provide a compact de scription of a number of current interests and trends within the heavy particle structure and collisions field in a sufficiently general, non-specialized way that interested scientists who wish to become acquainted with such interests and trends can do so without becoming bogged down in excessive archival detail. It is, therefore, hoped that the book will be of some use to advanced students who seek a general in troduction to these subjects. Numerous, more specialized, archival review articles are frequently referred to in each chapter for the benefit of those who seek more detailed knowledge about particular topics discussed. The editor wishes to acknowledge the support of two U. S. government agencies: the Office of Naval Research and the National Science Foundation, during the preparation of this volume.

Sincere thanks are due Mrs. Betty Thoe for her excellent editorial work on the various manuscripts and Mrs. This book provides a coherent introduction to the manifestations of chaos in atoms and molecules. This book covers polarization, alignment, and orientation effects in atomic collisions induced by electron, heavy particle, or photon impact. The first part of the book presents introductory chapters on light and particle polarization, experimental and computational methods, and the density matrix and state multipole formalism. Examples and exercises are included. The second part of the book deals with case studies of electron impact and heavy particle excitation, electron transfer, impact ionization, and autoionization. A separate chapter on photo-induced processes by new-generation light sources has been added. The last chapter discusses related topics and applications. Part III includes examples of charge clouds and introductory summaries of selected seminal papers of tutorial value from the early history of the field (1925 – 1975). The book is a significant update to the previous (first) edition, particularly in experimental and computational methods, the inclusion of key results obtained during the past 15 years, and the extended coverage of photo-induced processes. It is intended as an introductory text for both experimental and theoretical students and researchers. It can be used as a textbook for graduate courses, as a primary source for special topics and seminar courses, and as a standard reference. The book is accompanied by electronically available copies of the full text of the key papers in Part III, as well as animations of theoretically predicted electron charge clouds and currents for some of the cases discussed in Part II. Niels Bohr ' s atomic theory of 1913 is one of the absolute highlights in the history of modern science. It was only with this work that physicists realized that quantum theory is an essential ingredient in atomic physics, and it was also only with this work that Rutherford ' s nuclear model dating from 1911 was transformed into a proper theory of atomic structure. In a longer perspective, Bohr ' s quantum atom of 1913 gave rise to the later Heisenberg-Schr ö dinger quantum mechanics and all its marvellous consequences. This book is a detailed account of the origin of the Bohr atom centred around his original scientific articles of 1913 which are here reproduced and provided with the necessary historical background. In addition to the so-called trilogy – the three papers published in Philosophical Magazine – also two other

and less well-known yet important papers are included. The present work starts with a condensed biographical account of Bohr ' s life and scientific career, from his birth in Copenhagen in 1885 to his death in the same city 77 years later. It then proceeds with a chapter outlining earlier ideas of atomic structure and tracing Bohr ' s route from his doctoral dissertation in 1911 over his stays in Cambridge and Manchester to the submission in April 1913 of the first part of the trilogy. The reproduction of Bohr ' s five articles is followed by notes and comments directly related to the texts, with the aim of clarifying some of the textual passages and to explicate names and subjects that may not be clear or well known. The reception of Bohr ' s radically new theory by contemporary physicists and chemists is discussed in a final chapter, which deals with the immediate reactions to Bohr's theory 1913-1915 mostly among British, German and American scientists. Historians of science have long been occupied with Bohr ' s atomic theory, which was the subject of careful studies in connection with its centenary in 2013. The present work offers an extensive source-based account of the original theory aimed at a non-specialist audience with an interest in the history of physics and the origin of the quantum world. In 1922 Bohr was awarded the Nobel Prize for his theory. The coming centenary will undoubtedly cause an increased interest in how he arrived at his revolutionary picture of the constitution of atoms and molecules. This fourth edition contains a few additional figures. Otherwise only typographical er rors have been removed. The final chapter on Fundamentals of the Quantum Theory of Chemical Bonding is continued in an extended way in the textbook Molecular Physics and Elements of Quantum Chemistry by the same authors. This book contains, in particular, a profound presentation of group theory as applied to atoms and molecules. Furthermore, the in teraction between atoms and molecules and light is treated in detail. We thank again Springer-Verlag, in particular Dr. H.1. Kblsch and Mr. C.-D. Bachem for their excellent cooperation as always, and Prof. W. D. Brewer for his con tinuous support in translating our German text. Stuttgart, February 1994 H. Haken H. C. Wolf Preface to the Third Edition The second edition of this book again enjoyed a very positive reception from both uni versity teachers and students. In this edition we have removed all of the typographical errors that came to our attention. In order to keep the book as current as

possible, new developments in the direct observation of individual atoms in electromagnetic traps (Paul traps) and of atoms in molecules on solid surfaces using the scanning tunnel microscope have been added to this edition. This book is a short outline of the present state of the theory of electron collisions with atomic particles - atoms, molecules and ions. It is addressed to those who by nature of their work need detailed information about the cross sections of various processes of electron collisions with atomic particles: experimentalists working in plasma physics, optics, quantum electronics, atmospheric and space physics, 'etc. Some of the cross sections have been measured. But in many important cases the only source of information is theoretical calcu lation. The numerous theoretical papers dealing with electronic collision processes contain various approximations. The inter relation between them and the level of their accuracy is often diffi cult to understand without a systematic study of the theory of atomic collisions, not to mention that theoretical considerations are necessary for the consistent interpretation of experimental results. The main constituents of the book are: 1. General theory with special emphasis on the topics most impor tant for understanding and discussing electron collisions with atomic particles. The highly positive affirmation and wide reception that this book continues to receive from professors and students ahke is the occasion for this 7th edition. Once again we have included a number of valuable suggestions for improvements, which we address as appropriate. In addition, we refer to a number of developments in atomic physics. Of these new developments in regard to exotic atoms, we mention antihydrogen in par ticular, because fundamental experiments in matter and antimatter can be expected in the future. Furthermore, we have inserted a chapter on the behaviour of atoms in strong elec trical fields. Experiments with corresponding lasers could only recently be realized. We thank our Jenaer colleague, R. Sauerbrey, for his contribution of this chapter. We have also included a new chapter on the behaviour of the hydrogen atom in strong magnetic fields. The results are of profound interest for two very different fields of physics: on the one hand, according to classical physics, one expects chaotic behaviour from Rydberg atoms in magnetic fields that can be created in the laborato ry; thus, an association can be drawn to aspects of chaos theory and the problems of quantum chaos. On the other hand, the

very strong fields necessary for low quantum numbers are realized in the cosmos, in particular with white dwarfs and neutron stars. Aimed at senior undergraduate and first-year graduate students in departments of physics and astronomy, this textbook gives a systematic treatment of atomic and molecular structure and spectra, together with the effect of weak and strong external electromagnetic fields. Topics chosen are those of interest in astronomy, and indeed many were inspired by specific astronomical contexts. Examples include the negative ion of hydrogen and the effects of strong magnetic fields such as those occurring on certain white dwarfs and neutron stars. Adiabatic and non-adiabatic handling of electron correlations and application to processes such as dielectronic recombination are included. Astronomical examples are provided throughout, as well as end-of-the-chapter problems and exercises. Over seventy illustrative diagrams complete this unique and comprehensive volume. Computational Atomic Physics deals with computational methods for calculating electron (and positron) scattering from atoms and ions, including elastic scattering, excitation, and ionization processes. Each chapter is divided into abstract, theory, computer program with sample input and output, summary, suggested problems, and references. An MS-DOS diskette is included, which holds 11 programs covering the features of each chapter and therefore contributing to a deeper understanding of the field. Thus the book provides a unique practical application of advanced quantum mechanics. "The textbook itself is the culmination of the authors' many years of teaching and research in atomic physics, nuclear and particle physics, and modern physics. It is also a crystallization of their intense passion and strong interest in the history of physics and the philosophy of science. Together with the solution manual which presents solutions to many end-of-chapter problems in the textbook, they are a valuable resource to the instructors and students working in the modern atomic field."--Publisher's website. The aim of the book is to give a coherent and comprehensive account of quantum scattering theory with applications to atomic, molecular and nuclear systems. The motivation for this is to supply the necessary theoretical tools to calculate scattering observables of these many-body systems. Concepts, which are seemingly different for the atomic/molecular scattering from those for nuclear systems, are shown to be the same once the physical

units such as energy, length are diligently clarified. Many-body resonances excited in nuclear systems are the same as those in atomic systems and come under the name of Feshbach resonances. We clarify this. We also lean heavily on semi-classical methods to explain the physics of quantum scattering and especially the interference seen in the angle dependence of the cross section. Having in mind a wider readership, the book includes sections on scattering in two dimensions, which is of use in surface physics. Several problems are also included at the end of each of the chapters. The investigation of scattering phenomena is a major theme of modern physics. A scattered particle provides a dynamical probe of the target system. The practical problem of interest here is the scattering of a low energy electron by an N-electron atom. It has been difficult in this area of study to achieve theoretical results that are even qualitatively correct, yet quantitative accuracy is often needed as an adjunct to experiment. The present book describes a quantitative theoretical method, or class of methods, that has been applied effectively to this problem. Quantum mechanical theory relevant to the scattering of an electron by an N-electron atom, which may gain or lose energy in the process, is summarized in Chapter 1. The variational theory itself is presented in Chapter 2, both as currently used and in forms that may facilitate future applications. The theory of multichannel resonance and threshold effects, which provide a rich structure to observed electron-atom scattering data, is presented in Chapter 3. Practical details of the computational implementation of the variational theory are given in Chapter 4. Chapters 5 and 6 summarize recent appli cations of the variational theory to problems of experimental interest, with many examples of the successful interpretation of complex structural fea tures observed in scattering experiments, and of the quantitative prediction of details of electron-atom scattering phenomena. Originally published: New York: Wiley, 1980. Intended for advanced students of physics, chemistry and related disciplines, this text treats the quantum theory of atoms and ions within the framework of self-consistent fields. Data needed for the analysis of collisions and other atomic processes are also included. "This book introduces the fundamental quantum physics of atoms and molecules. Divided into three parts, the first provides a historical perspective leading to the contemporary view of atomic and molecular physics, outlining the principles of non-relativistic quantum

mechanics. The second part covers the physical description of atoms and their interaction with radiation, whilst the third part deals with molecular physics." -- Prov é de l'editor.

- 1000 Solved Problems In Modern Physics
- Nuclear And Particle Physics
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