

Introductory Nuclear Physics (3rd Edition)

Step-by-step solution

Step 1 of 5

Write the semi-empirical mass formula:

$$B.E. = a_v A - a_s A^{2/3} - a_c \frac{Z(Z-1)}{A^{1/3}} + a_{\text{sym}} \frac{(A-2Z)^2}{A} \pm a_p A^{-1/2}$$

Here, $B.E.$ is the binding energy, a_v is volume term, a_s is surface term, a_{sym} is asymmetry term, a_c is the coulomb term, a_p is parity term, A is mass number, and Z is the atomic number.

The parity term is positive for even Z and even A , negative for odd Z , and odd A and zero for even Z and odd A or odd Z and even A .

The values of the terms are as follows:

$$a_v = 15.5 \text{ MeV}$$

$$a_s = 16.8 \text{ MeV}$$

$$a_c = 0.72 \text{ MeV}$$

$$a_{\text{sym}} = 23 \text{ MeV}$$

$$a_p = 34 \text{ MeV}$$

Write the coulomb energy term,

$$E_c = a_c \frac{Z(Z-1)}{A^{1/3}}$$

Comment

Step 2 of 5

(a)

The mass number for ^{21}Ne is 21 and the atomic number is 10.

The binding energy of ^{21}Ne is as follows:

$$B.E. = a_v A - a_s A^{2/3} - a_c \frac{Z(Z-1)}{A^{1/3}} + a_{\text{sym}} \frac{(A-2Z)^2}{A} \pm a_p A^{-1/2}$$

Substitute 21 for A and 10 for Z .

$$B.E. = \left[(15.5 \text{ MeV})(21) - (16.8 \text{ MeV})(21)^{2/3} - (0.72 \text{ MeV}) \frac{10(10-1)}{(21)^{1/3}} + (23 \text{ MeV}) \frac{(21-2(10))^2}{(21)} \pm 0 \right]$$

$$= 175.2 \text{ MeV}$$

The coulomb energy of ^{21}Ne is as follows:

$$E_c = -a_c \frac{Z(Z-1)}{A^{1/3}}$$

Substitute 21 for A and 10 for Z .

$$E_c = -(0.72 \text{ MeV}) \frac{10(10-1)}{(21)^{1/3}}$$

$$= -23.5 \text{ MeV}$$

The coulomb energy of ^{21}Ne is $\boxed{-23.5 \text{ MeV}}$.

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Krane, 1991-01-16 **INTRODUCTORY NUCLEAR PHYSICS** Modern Atomic And Nuclear Physics (Revised Edition): Problems And Solutions Manual Fujia Yang, Joseph H Hamilton, 2010-06-01 This problems and solutions manual is intended as a companion to an earlier textbook Modern Atomic and Nuclear Physics Revised Edition World Scientific 2010 This manual presents solutions to many end of chapter problems in the textbook These solutions are valuable to the instructors and students working in the modern atomic field Students can master important information and concept in the process of looking at solutions to some problems and become better equipped to solve other problems that the instructors propose

Introduction To Modern Physics: Solutions To Problems Paolo Amore, John Dirk Walecka, 2013-08-16 Our understanding of the physical world was revolutionized in the twentieth century the era of modern physics The book Introduction to Modern Physics Theoretical Foundations aimed at the very best students presents the foundations and frontiers of today's physics Typically students have to wade through several courses to see many of these topics The goal is to give them some idea of where they are going and how things fit together as they go along The book focuses on the following topics quantum mechanics applications in atomic nuclear particle and condensed matter physics special relativity relativistic

quantum mechanics including the Dirac equation and Feynman diagrams quantum fields and general relativity The aim is to cover these topics in sufficient depth that things make sense to students and they achieve an elementary working knowledge of them The book assumes a one year calculus based freshman physics course along with a one year course in calculus Several appendices bring the reader up to speed on any additional required mathematics Many problems are included a great number of which take dedicated readers just as far as they want to go in modern physics The present book provides solutions to the over 175 problems in Introduction to Modern Physics Theoretical Foundations in what we believe to be a clear and concise fashion Introductory Nuclear Physics Krane Kenneth S.,2008 Introductory Nuclear Physics Peter Edward Hodgson,Ettore Gadioli,E. Gadioli Erba,1997 Nuclear physics is the study of the nuclei of atoms and their interactions This textbook is a comprehensive balanced and up to date introduction to the subject It describes both the experiments made to study nuclear reactions and nuclear structure and the theories and models that have been developed to understand the properties of nuclei and their interactions Introductory nuclear physics will serve both as a textbook for undergraduates and graduates and as a useful reference work for professional nuclear physicists An Introduction to Differential Equations and Their Applications Stanley J. Farlow,2012-10-23 This introductory text explores 1st and 2nd order differential equations series solutions the Laplace transform difference equations much more Numerous figures problems with solutions notes 1994 edition Includes 268 figures and 23 tables **Nuclear Science Abstracts** ,1975 NSA is a comprehensive collection of international nuclear science and technology literature for the period 1948 through 1976 pre dating the prestigious INIS database which began in 1970 NSA existed as a printed product Volumes 1 33 initially created by DOE s predecessor the U S Atomic Energy Commission AEC NSA includes citations to scientific and technical reports from the AEC the U S Energy Research and Development Administration and its contractors plus other agencies and international organizations universities and industrial and research organizations References to books conference proceedings papers patents dissertations engineering drawings and journal articles from worldwide sources are also included Abstracts and full text are provided if available **Problems and Solutions in Nuclear and Particle Physics** Sergio Petrer,2019-07-16 This book presents 140 problems with solutions in introductory nuclear and particle physics Rather than being only partially provided or simply outlined as is typically the case in textbooks on nuclear and particle physics all solutions are explained in detail Furthermore different possible approaches are compared Some of the problems concern the estimation of quantities in realistic experimental situations In general solving the problems does not require a substantial mathematics background and the focus is instead on developing the reader s sense of physics in order to work out the problem in question Consequently sections on experimental methods and detection methods constitute a major part of the book Given its format and content it offers a valuable resource not only for undergraduate classes but also for self assessment in preparation for graduate school entrance and other examinations Introduction to Linear Control Systems Yazdan Bavafa-Toosi,2017-09-19 Introduction to

Linear Control Systems is designed as a standard introduction to linear control systems for all those who one way or another deal with control systems. It can be used as a comprehensive up to date textbook for a one semester 3 credit undergraduate course on linear control systems as the first course on this topic at university. This includes the faculties of electrical engineering, mechanical engineering, aerospace engineering, chemical and petroleum engineering, industrial engineering, civil engineering, bio engineering, economics, mathematics, physics, management and social sciences etc. The book covers foundations of linear control systems, their *raison d'être*, different types, modelling, representations, computations, stability concepts, tools for time domain and frequency domain analysis and synthesis and fundamental limitations with an emphasis on frequency domain methods. Every chapter includes a part on further readings where more advanced topics and pertinent references are introduced for further studies. The presentation is theoretically firm, contemporary and self contained. Appendices cover Laplace transform and differential equations, dynamics, MATLAB and SIMULINK, treatise on stability concepts and tools, treatise on Routh Hurwitz method, random optimization techniques as well as convex and non convex problems and sample midterm and endterm exams. The book is divided into the sequel 3 parts plus appendices. PART I In this part of the book, chapters 1-5 we present foundations of linear control systems. This includes the introduction to control systems, their *raison d'être*, their different types, modelling of control systems, different methods for their representation and fundamental computations, basic stability concepts and tools for both analysis and design, basic time domain analysis and design details and the root locus as a stability analysis and synthesis tool. PART II In this part of the book, Chapters 6-9 we present what is generally referred to as the frequency domain methods. This refers to the experiment of applying a sinusoidal input to the system and studying its output. There are basically three different methods for representation and studying of the data of the aforementioned frequency response experiment: these are the Nyquist plot, the Bode diagram and the Manger Nichols chart. We study these methods in details. We learn that the output is also a sinusoid with the same frequency but generally with different phase and magnitude. By dividing the output by the input we obtain the so called sinusoidal or frequency transfer function of the system which is the same as the transfer function when the Laplace variable s is substituted with $j\omega$. Finally we use the Bode diagram for the design process. PART III In this part, Chapter 10 we introduce some miscellaneous advanced topics under the theme fundamental limitations which should be included in this undergraduate course at least in an introductory level. We make bridges between some seemingly disparate aspects of a control system and theoretically complement the previously studied subjects. Appendices The book contains seven appendices. Appendix A is on the Laplace transform and differential equations. Appendix B is an introduction to dynamics. Appendix C is an introduction to MATLAB including SIMULINK. Appendix D is a survey on stability concepts and tools. A glossary and road map of the available stability concepts and tests is provided which is missing even in the research literature. Appendix E is a survey on the Routh Hurwitz method also missing in the literature. Appendix F is an introduction to random optimization techniques and

convex and non convex problems Finally appendix G presents sample midterm and endterm exams which are class tested several times

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Enumath 97 - Proceedings Of The Second European Conference On Numerical Mathematics And Advanced Applications Hans Georg Bock,Guido Kanschat,Rolf Rannacher,Franco Brezzi,Roland Glowinski,Yuri A Kuznetsov,Jacques Periaux,1998-11-06 The ENUMATH conferences were established in 1995 in order to provide a forum for discussion on recent topics of numerical mathematics They seek to bring together leading experts and young scientists with special emphasis on contributions from Europe In the second ENUMATH conference in 1997 recent results and new trends in the analysis of numerical algorithms as well as their application to challenging scientific and industrial problems were discussed Apart from theoretical aspects a major part of the conference was devoted to numerical methods in interdisciplinary applications The topics covered in this proceedings include higher order finite element methods non matching grids least squares methods for partial differential equations multiscale analysis boundary element method optimization in partial differential equations solid mechanics microstructures computational fluid dynamics computational electrodynamics and semiconductors

Introduction To Nuclear And Particle Physics: Solutions Manual For Second Edition Of Text By Das And Ferbel Ashok Das,Thomas Ferbel,Carl Bromberg,2006-08-25 This manual gives the solutions to all problems given in the book by A Das and T Ferbel The problems are discussed in full detail to help both the student and teacher get a better grasp of the issues brought up in the text and in the associated problems

An Introduction to the Mathematical Structure of Quantum Mechanics F. Strocchi,2008 Arising out of the need for Quantum Mechanics QM to be part of the common education of mathematics students this book formulates the mathematical structure of QM in terms of the C algebra of observables which is argued on the basis of the operational definition of measurements and the duality between states and observables

An Introduction to the Theory of the Boltzmann Equation Stewart Harris,2004-01-01 This introductory graduate level course for students of physics and engineering features detailed presentations of Boltzmann s equation including applications using both Boltzmann s equation and the model Boltzmann equations developed within the text It emphasizes physical aspects of the theory and offers a practical resource for researchers and other professionals 1971 edition

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Unified Field Mechanics Ii: Formulations And Empirical Tests - Proceedings Of The Xth Symposium Honoring Noted French Mathematical Physicist Jean-pierre Vigier Richard L Amoroso,Louis H Kauffman,Peter Rowlands,Gianni Albertini,2018-01-08 This volume recording the 10th international

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Quantum Mechanics Richard Robinett, 2006-04-13 Quantum Mechanics is a comprehensive introduction to quantum mechanics for advanced undergraduate students in physics It provides the reader with a strong conceptual background in the subject extensive experience with the necessary mathematical background as well as numerous visualizations of quantum concepts and phenomena

Advances in Neural Computation, Machine Learning, and Cognitive Research III Boris Kryzhanovsky, Witali Dunin-Barkowski, Vladimir Redko, Yury Tiumentsev, 2019-09-03 This book describes new theories and applications of artificial neural networks with a special focus on answering questions in neuroscience biology and biophysics and cognitive research It covers a wide range of methods and technologies including deep neural networks large scale neural models brain computer interface signal processing methods as well as models of perception studies on emotion recognition self organization and many more The book includes both selected and invited papers presented at the XXI International Conference on Neuroinformatics held on October 7 11 2019 in Dolgoprudny a town in Moscow region Russia

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