How to Use This Book

This book will teach you how to do physics problems. The explanation of not only how to do a problem but why we do it a certain way teaches you not just a collection of solved problems, but a collection of methods that can be used, modified, and built upon to do other physics problems. As researchers and teachers, we know that the key to solving new and challenging problems is contained within the collection of techniques already learned for solving simpler problems. Seeing a problem solved and knowing why it was done in a certain manner is the best way to learn how to solve related, more difficult problems.

This book is not a presentation of every problem you are going to encounter on a test. It is a presentation of the methods that we have found to work for large groups of problems. If you develop the techniques we describe for solving problems then you will know how to successfully attack the problems you will encounter on the tests. This is the book you should have as a reference when you are doing your homework problems. It will show you how to work the problems and explain why they are being done the way they are.

The topics in this book are in the order of most physics texts. Each chapter begins with a theoretical discussion. Problems are mixed in with the discussion as soon as possible. These problems follow the development of the theory. In this way you do not have to assimilate a large amount of conceptual material before begining to work problems.

A “standard” route is followed for problems wherever possible. In this way you will learn that broad categories of problems worked in a standard “logical” way always produce correct solutions. Our emphasis is on logic and order in solving problems. We avoid methods that may be quick and have limited application to problem solving in favor of possibly longer solutions that have broad applications and always work. We believe that a lot of good physics can be taught in problems so we use problems to illustrate and expand a topic and sometimes introduce new concepts. For this reason problems and text are integrated with a minimum of artificial barriers between them.

The book is intended as a complement to either the calculus-based or the non-calculus-based elementary physics course. It has been our experience that calculus concepts can be introduced into the traditional non-calculus course and used in the development of concepts. Conceptually, calculus is not difficult and when it is introduced in the context of a physics problem it is even easier. We use calculus concepts to explain theory, but calculus is rarely used in problems. Even those students who are taking calculus concurrent with their physics course usually learn calculus concepts in physics before they see them in their calculus course.

In those instances where calculus is needed, the problems and paragraphs are marked with a calculus icon. Even the student without formal calculus training should read these sections. They are often explained in a simple manner so that the calculus does not present a problem.

The chapters on electricity and magnetism are also excellent background chapters for someone taking an undergraduate course in Electricity and Magnetism.

We have used two significant figures for the physical constants and most of the numbers in the problems. Results are given to two, and occasionally three, significant figures. Using two significant figures cuts down on the clutter in the problems, allowing the technique to receive greater exposure. Do not be concerned in working through the problems if your answers do not agree exactly with ours. This is no doubt due to when, or if, intermediate calculations were rounded off. SI units are used nearly universally throughout the book.