1-1958

Physics, Preface

Henry Semat
City College of New York

Robert Katz
University of Nebraska-Lincoln, rkatz2@unl.edu

Preface

This book is intended for students of science and engineering; it aims to develop both an understanding of the important concepts of physics and some analytical skill in the solutions of problems. The mathematical level of the book is such that it may be used by students who are taking a course in calculus concurrently.

The notations and methods of the calculus are introduced early in the text, beginning with the concept of a derivative in the discussion of motion, and are then extended to more complex problems as the student progresses both in physics and in mathematics. Vector algebra is, of course, also used. The vector notation is introduced at the beginning of the text in treating displacements; it is then extended to include the use of the dot product and cross product of two vectors, and the resolution of a vector into components with the aid of unit vectors. These vector methods are used extensively in the sections on Mechanics and Electricity.

The method of exposition and the division of the subject matter into six parts—Mechanics, Heat, Wave Motion and Sound, Electricity and Magnetism, Optics, and Atomics and Nucleonics—follow closely those of the senior author's *Fundamentals of Physics*, now in its third edition. However, the treatment of much of the material is entirely new, as are over two hundred of the figures. The problems at the end of each chapter are graded in difficulty, and many illustrative examples are provided in the text both to clarify concepts and to guide the student in the analytical approach to the solutions of problems. Included among these problems are some involving selected derivations and some requiring the use of calculus. Answers to odd-numbered problems are given in the Appendix, and a booklet containing all the answers is available to the instructor and may be distributed to his students if he so desires.

Three systems of units are developed and used in the sections on Mechanics, Heat, and Sound; these are the British engineering system, and the cgs and mks metric systems. In the section on Electricity and Magnetism, the rationalized mks system is the primary one, but the unrationalized Gaussian system is also developed because of its wide use in all of physics and much of engineering. The Gaussian system is introduced in the early chapters of Electricity; in subsequent

chapters it is used only when new concepts are introduced or when important equations are developed. The forms taken by each important equation in both the mks and the Gaussian systems are presented in a table at the end of the appropriate chapter, while the necessary conversion factors for the units and constants of each system appear in another table. Problems at the end of each chapter are given in both sets of units.

In developing the subject of Electricity and Magnetism we were guided by the recommendations of the Coulomb Law Committee of the American Association of Physics Teachers and we followed these recommendations fairly closely. We take this opportunity of expressing our indebtedness and appreciation to this Committee.

We have used modern concepts and examples throughout the book, and in addition have devoted an entire separate section to Atomics and Nucleonics. The reason for this section is that the traditional two- or three-semester course in physics is actually a terminal course for a great many students; this course will be their only opportunity to learn about atomic and nuclear physics from a physicist's point of view. Wherever a separate course in atomic and nuclear physics is part of the curriculum, this section may be omitted from the general course.

We wish to thank Professor Karl D. Larsen, Head of the Department of Physics at Lafayette College, Professor I. Wallerstein of Purdue University, and Professor Robert A. Becker of the University of Illinois, each of whom read the manuscript and made many valuable criticisms and helpful suggestions.

We are also indebted to several colleagues at our respective institutions who read different parts of the manuscript and made valuable criticisms and helpful suggestions. At Kansas State College Professor R. M. Kerchner, Head of the Electrical Engineering Department, read the section on Electricity and Magnetism; Professor L. D. Ellsworth of the Physics Department read the sections on Electricity and Magnetism and Optics, and Professor Basil Curnutte, Jr., of the Physics Department read the section on Optics. At the City College of New York, Professor M. W. Zemansky, Chairman of the Physics Department, read the section on Heat, Professor Fred C. Rose read the section on Electricity and Magnetism, and Professor Robert I. Wolff read the section on Optics.

HENRY SEMAT
City College of New York

ROBERT KATZ
Kansas State College

January, 1958