

Fundamental Formulas of Physics

edited by Donald H. Menzel

BASIC MATHEMATICAL FORMULAS

STATISTICS

NOMOGRAMS

PHYSICAL CONSTANTS

CLASSICAL MECHANICS

SPECIAL THEORY OF RELATIVITY

THE GENERAL THEORY OF RELATIVITY

HYDRODYNAMICS AND AERODYNAMICS

BOUNDARY VALUE PROBLEMS IN MATHEMATICAL PHYSICS

HEAT AND THERMODYNAMICS

STATISTICAL MECHANICS

KINETIC THEORY OF GASES:

VISCOSITY, THERMAL CONDUCTION, AND DIFFUSION

ELECTROMAGNETIC THEORY

ELECTRONICS

SOUND AND ACOUSTICS

VOLUME ONE

FUNDAMENTAL FORMULAS OF PHYSICS

EDITED BY

DONALD H. MENZEL
DIRECTOR, HARVARD COLLEGE OBSERVATORY

In Two Volumes

VOLUME ONE

DOVER PUBLICATIONS, INC.
NEW YORK

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Published in Canada by General Publishing Company, Ltd., 30 Lesmill Road, Don Mills, Toronto, Ontario.

Published in the United Kingdom by Constable and Company, Ltd., 10 Orange Street, London WC 2.

This Dover edition, first published in 1960, is an unabridged and revised version of the work originally published in 1955 by Prentice-Hall, Inc. The first edition appeared in one volume, but this Dover edition is divided into two volumes.

International Standard Book Number: 0-486-60595-7

Library of Congress Catalog Card Number: 60-51149

Manufactured in the United States of America
Dover Publications, Inc.
180 Varick Street
New York, N. Y. 10014

P R E F A C E

A survey of physical scientists, made several years ago, indicated the need for a comprehensive reference book on the fundamental formulas of mathematical physics. Such a book, the survey showed, should be broad, covering, in addition to basic physics, certain cross-field disciplines where physics touches upon chemistry, astronomy, meteorology, biology, and electronics.

The present volume represents an attempt to fill the indicated need. I am deeply indebted to the individual authors, who have contributed time and effort to select and assemble formulas within their special fields. Each author has had full freedom to organize his material in a form most suitable for the subject matter covered. In consequence, the styles and modes of presentation exhibit wide variety. Some authors considered a mere listing of the basic formulas as giving ample coverage. Others felt the necessity of adding appreciable explanatory text.

The independence of the authors has, inevitably, resulted in a certain amount of overlap. However, since conventional notation may vary for the different fields, the duplication of formulas should be helpful rather than confusing.

In the main, authors have emphasized the significant formulas, without attempting to develop them from basic principles. Apart from this omission, each chapter stands as a brief summary or short textbook of the field represented. In certain instances, the authors have included material not heretofore available.

The book, therefore, should fill needs other than its intended primary function of reference and guide for research. A student may find it a handy aid for review of familiar field or for gaining rapid insight into the techniques of new ones. The teacher will find it a useful guide in the broad field of physics. The chemist, the astronomer, the meteorologist, the biologist, and the engineer should derive valuable aid from the general sections as well as from the cross-field chapters in their specialties. For example, the chapter on Electromagnetic Theory has been designed to meet

the needs of both engineers and physicists. The handy conversion factors facilitate rapid conversion from Gaussian to MKS units or vice versa.

In a work of this magnitude, some errors will have inevitably crept in. I should appreciate it, if readers would call them to my attention.

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FUNDAMENTAL
FORMULAS
of
PHYSICS

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