PHYSICAL MEASUREMENTS

Published @ 2017 Trieste Publishing Pty Ltd

ISBN 9780649256570

Physical measurements by A. Wilmer Duff

Except for use in any review, the reproduction or utilisation of this work in whole or in part in any form by any electronic, mechanical or other means, now known or hereafter invented, including xerography, photocopying and recording, or in any information storage or retrieval system, is forbidden without the permission of the publisher, Trieste Publishing Pty Ltd, PO Box 1576 Collingwood, Victoria 3066 Australia.

All rights reserved.

Edited by Trieste Publishing Pty Ltd.
Cover @ 2017

This book is sold subject to the condition that it shall not, by way of trade or otherwise, be lent, re-sold, hired out, or otherwise circulated without the publisher's prior consent in any form or binding or cover other than that in which it is published and without a similar condition including this condition being imposed on the subsequent purchaser.

www.triestepublishing.com

A. WILMER DUFF

PHYSICAL MEASUREMENTS

Trieste

PHYSICAL MEASUREMENTS

DUFF and EWELL

Physics

BLAKISTON'S SCIENCE SERIES

PHYSICAL MEASUREMENTS

BY

A. WILMER DUFF

PROFESSOR OF PHYSICS IN THE WORCESTER POLYTECHNIC INSTITUTE

AND

ARTHUR W. EWELL

PROFESSOR OF PHYSICS IN THE WORCESTER POLYTECHNIC INSTITUTE

SECOND EDITION, REVISED AND ENLARGED

WITH 78 ILLUSTRATIONS

PHILADELPHIA

P. BLAKISTON'S SON & CO.

1012 WALNUT STREET

1910

106459

23/11/10

COPYRIGHT, 1910, BY P. BLAKISTON'S SON & CO.

Printed by
The Maple Press
York, Pa.

PREFACE.

Our intention in writing this book was not to give an account of physical laboratory methods in general, but to describe a limited number of carefully chosen exercises such as we have found in our experience to be suitable for the laboratory work of students who have had a fair course in General College Physics.

The descriptions of the exercises will usually fit apparatus and conditions of considerable diversity, but many practical details have been included where experience has shown that they are necessary. Other instructors who may adopt the book will probably find some of the exercises unsuited to their classes, but the list is sufficiently extensive to afford a considerable variety of selection.

The descriptions of apparatus are intended to be read by the student with the apparatus before him. Hence elaborate illustrations have been thought unnecessary. For an extended account of certain special topics, such as the theory of the balance and the construction of galvanometers, references to other works have been given.

Usually several text-books and special treatises have been referred to at the beginning of the account of an experiment. It is assumed that each student will have one of the text-books and that some of the special works will be found in the reference room of the laboratory. While the reference is generally to the latest edition (at the present date, 1910), those who have different editions will have no difficulty in finding the passages referred to. Each instructor who uses

the book will exercise his discretion as to what preliminary reading will be required and will issue the necessary instructions to his class.

We are indebted to Dr. Albert W. Hull for assistance in reading the page proof. Many of the tables have been taken from Ewell's Physical Chemistry.

CONTENTS.

PAGE

GENERAL INTRODUCTION 1

1. Purpose of Course. 2. General Directions. 3. Reports. 4. Errors. 5. Errors of Observation. 6. Possible Error of a Calculated Result. 7. General Method for the Possible Error of a Result. 8. Some General Notes on Errors. 9. Probable Error of a Mean. 10. Limits to Calculations. 11. Notation of Large and Small quantities. 12. Plotting of Curves.

MECHANICS 13

13. The Use of a Vernier. 14. Vernier Caliper. 15. Micrometer Caliper. 16. Micrometer Microscope. 17. Comparator. 18. Spherometer. 19. Dividing Engine. 20. Cathetometer. 21. Barometer. 22. The Balance. 23. Adjustment of Telescope and Scale. 24. Time Determination.

I. To Make and Calibrate a Scale.
II. Errors of Weights.
III. Volume, Mass, and Density of a Regular Solid.

IV. Mohr-Westphal Specific Gravity Balance.
V. Density by the Volumenometer.
VI. Density of Gases.
VII. Acceleration of Gravity by Pendulum.
VIII. Coefficient of Friction.
IX. Hooke's Law and Young's Modulus.
X. Rigidity (or Shear Modulus).
XI. Viscosity.
XII. Surface Tension.

HEAT 63

25. Radiation Correction in Calorimetry. 26. The Beckmann Thermometer.
XIII. Thermometer Testing.
XIV. Temperature Coefficient of Expansion.