PHYSICAL CHEMISTRY

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An Introductory Text-book

BY

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PREFACE

It is hoped that this book will meet the need for a laboratory manual of experiments in physical chemistry suitable for school and college use. The limited time and equipment usually available render impracticable many physical chemistry experiments described in existing text-books. A number of these have here been simplified and adapted: they have all been thoroughly tried out and, in many cases, specimen results are quoted that have been obtained by students using the experimental methods and apparatus described in the text.

Many students do not begin to get a real understanding of a new subject until they observe the phenomena for themselves in the laboratory. In this book, therefore, each topic is introduced by means of a few short experiments designed to demonstrate in a simple manner the subject-matter of the section. These experiments are followed by brief theoretical sections. An outline of the historical development of the subject is included where possible, because this often throws considerable light on the present state of knowledge and theory. At the end of each section, a number of other experiments are described, some of which at least the student should perform for himself. More experiments are included than would normally be done by any one student in an introductory course.

The choice of topics to be included in the subject of physical chemistry is somewhat arbitrary: in fact several of them are treated both in physics and in chemistry text-books. The selection made here is governed by the suitability of the various topics for experimental treatment in school or college laboratory. Hence a few that are often included in text-books of physical chemistry have here been omitted. For example, the experimental work on radioactivity, optical spectra, X-ray spectro-

scopy and the mass spectrograph leading to our knowledge of atomic structures, is omitted as being too complex to be reproduced in an introductory course. On the other hand, the classical atomic theory, on which the science of theoretical chemistry is largely based, is treated more fully than usual. In the author's opinion, the history of the atomic theory in the first half of the nineteenth century is rarely given the place of importance it merits, and, in view of the complex and rather confused manner in which the theory developed, it is not surprising that students often do not have a clear understanding of its significance.

The treatment is throughout from the point of view of the kinetic-molecular theory rather than that of the laws of thermodynamics. The mathematics have been kept simple: emphasis is rather laid on the physico-chemical phenomena themselves and their significance in various branches of science such as metallurgy, chemical syntheses, analytical methods, biology, mineralogy and so on. There are already many written exercises and calculations published in other text-books and therefore none have been included here.

I wish to express my thanks to Dr J. A. Kitchener for reading the proofs and making many valuable suggestions, and to my pupil, J. F. Duke, who drew most of the diagrams. I should also like to thank the Publishers for helpful criticisms of the manuscript and for the trouble they have taken in preparing it for the press. The loan of blocks for the following figures is gratefully acknowledged: Messrs Macmillan, Figs. 38, 40, 77, 104, Messrs Longmans, Figs. 84 and Plate 4*a* and *b*.

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