PHYSICO-CHEMICAL CALCULATIONS

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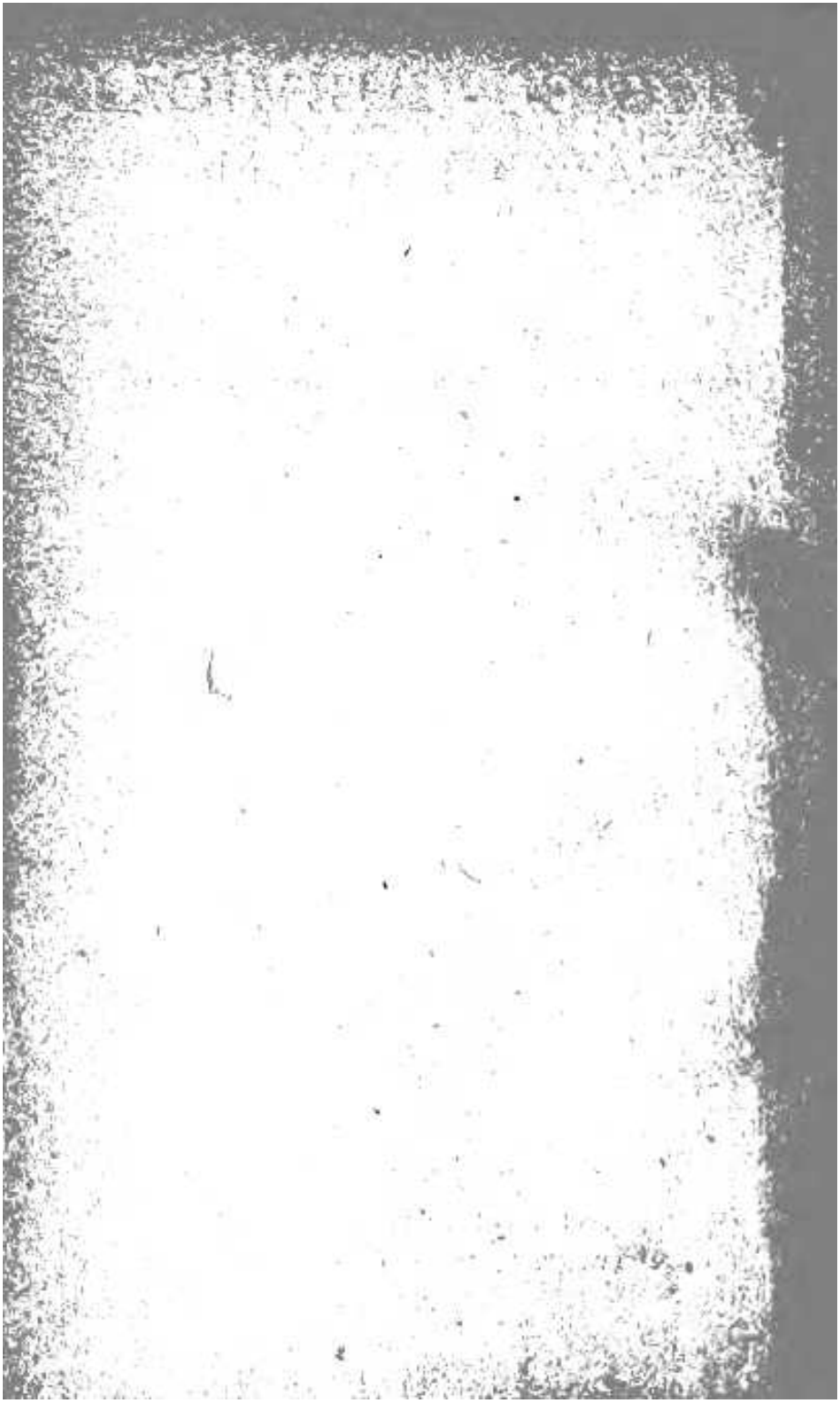

PREFACE

THIS collection of physico-chemical problems is based on Abegg and Sackur's "Physikalisch-Chemische Rechen-aufgaben" (Sammlung Göschen).

The original intention was simply to translate the German book, which consists of a short summary of the laws and formulæ used in the problems, and fifty-two typical problems, with full solutions. With the consent of the late Professor Abegg and of Dr. Sackur, however, I decided to arrange the subject-matter in chapters dealing with the main subdivisions of physical chemistry, and to write a short introduction to each chapter, dealing with the theory involved in the problems. Most of the problems in the "Rechenaufgaben" have been retained, a good many additional solved problems have been introduced, and a collection of problems for solution (with answers) has been added at the end of each chapter. The size of the book has thus been more than doubled.

Most of the problems have been taken direct, or with slight modification, from the original literature.

I shall be grateful to have any errors in the text pointed out to me.

I would take this opportunity of expressing my indebtedness to the late Professor Richard Abegg, and to Dr. Otto Sackur, of the University of Breslau, for their kindness in allowing me to make use of their "Rechenaufgaben" as the basis of this book.

J. K.

ABERDEEN,
December, 1911.

CONTENTS

PHYSICO-CHEMICAL CALCULATIONS

CHAPTER I

GAS LAWS—GASEOUS DISSOCIATION—OSMOTIC PRESSURE

Gas Laws

THE relation between the pressure, volume and temperature of any given mass of gas is expressed by the equation

$$(1)\quad \frac{Pv}{T} = \frac{P'v'}{T'}$$

where P and v are the pressure and volume corresponding to the absolute temperature T and P' and v' the pressure and volume corresponding to the absolute temperature T'. The absolute temperature is equal to $273 + t$, where t is the temperature centigrade. The pressure and volume may be expressed in any units.

This relation may also be expressed in the form

$$\frac{Pv}{T} = \text{constant, or } Pv = \text{constant} \times T.$$

The value of the constant varies with the units of pressure and volume and with the mass of gas considered. For the gram-molecular quantity of all gases, however, the value of the constant is the same. For a gram-molecule of a gas the equation, therefore, becomes

$$Pv = RT,$$

and for n gram-molecules

$$(2)\quad Pv = nRT \text{ (Boyle, Gay-Lussac, Avogadro).}$$