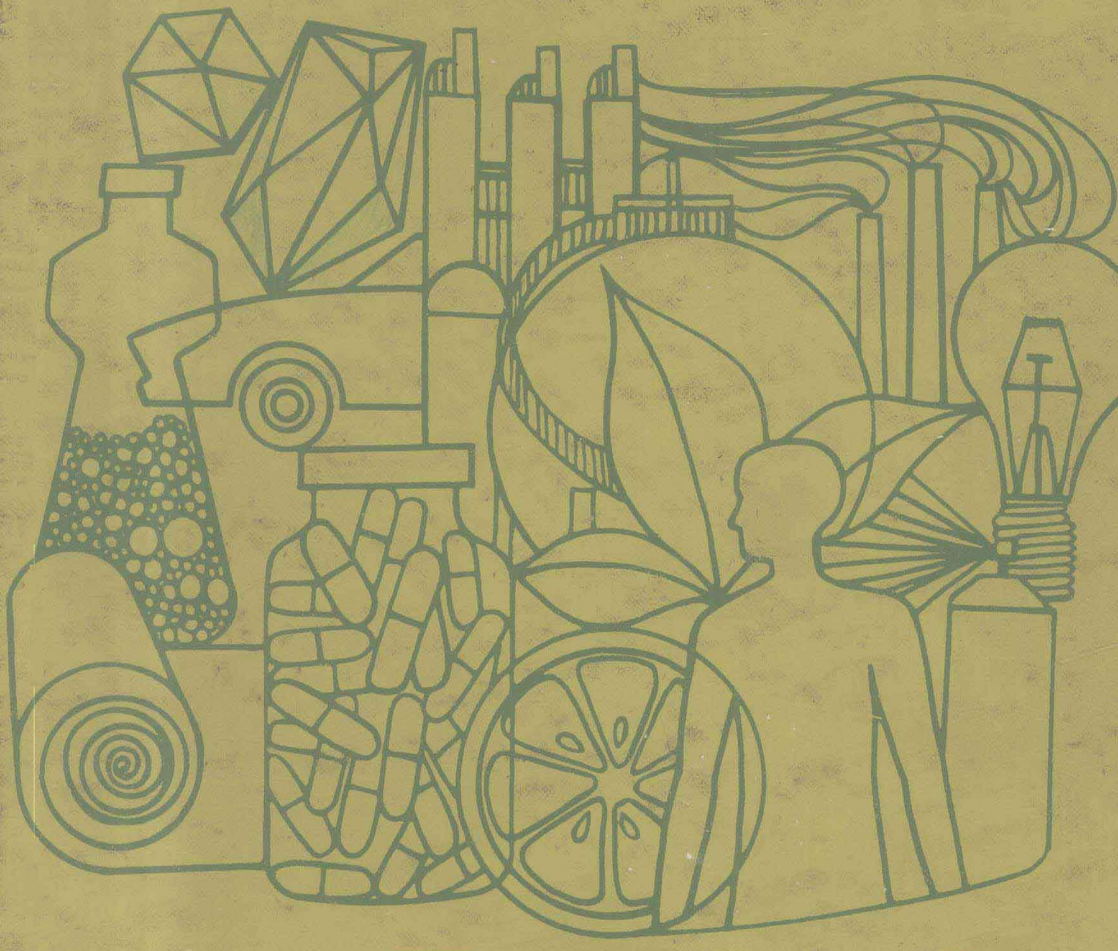

General Chemistry

WILLIAMS EMBREE DeBEY

Second Edition

GENERAL CHEMISTRY

SECOND EDITION

ARTHUR L. WILLIAMS
HARLAND D. EMBREE
HAROLD J. DEBEY

California State University, San Jose

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GENERAL CHEMISTRY SECOND EDITION

PREFACE TO THE SECOND EDITION

The rapid advance in all areas of the sciences presents a particular problem to those who write textbooks, including introductory texts. When writing the first edition of this book we could not talk with definite knowledge of the composition of moon rocks, for no one had been there. Now some information is available, although a scientist must admit that the sampling is inadequate. As we write this, there is evidence, in fact conflicting evidence, for the discovery of elements 104 and 105. Our knowledge about pollution of the environment has grown to the extent that we can now make some valid generalizations and begin to propose solutions that seem ecologically sound.

Another reason for the revision of a textbook is that those who use the book have suggested changes. Most of these have been requests for addition of particular subjects that we had not included in the first edition. A few have been suggestions for improving the presentation of certain topics. Along with the pressure to add new material is the counterpressure from the publisher, and probably from the students who buy and use the book, to keep it a reasonable size.

Continued demand for the book suggests that there is a large group of students for whom it fills a need. We have tried to keep our original purpose of writing a text which emphasizes a rational approach and an application of chemistry to life, for readers with no previous course in chemistry.

Largely from our own concern about the deterioration of our environment (we live in a city that is too often smoggy), we have included a major chapter on the chemistry of the environment. After some debate we finally decided to keep this material together, rather than distributing it throughout the other chapters. We have placed it at the end of the book because certain facts and ideas are better discussed after the reader has some understanding of organic or biological chemistry. However, many sections of it could very well be read along with the early chapters of the book. We have added discussions of orbitals, oxidation–reduction equations, dialysis, and the basic oxygen furnace. We have expanded the discussion of pH.

Another reason authors want to revise is to eliminate errors that crept into the first edition. Here again we have been helped by our readers. We hope we have not introduced many new errors in this edition, and will be most grateful to our readers for reporting any which they do discover.

Those of you familiar with the first edition of this book will see that this edition is still written as an introduction to general chemistry with a brief introduction to organic chemistry and biochemistry. It is intended for use in a one-semester or one-quarter course. For those interested in a more extensive treatment of chemistry, we recommend the second edition of *Introduction To Chemistry* which the three of us wrote primarily to meet the needs of a student in a full-year course.

In *Introduction to Chemistry* the fields of organic and biochemistry are treated in some detail and comprise a total of twenty-four chapters (rather than only the two chapters found in this book).

In the first edition, as in this, we have chosen to include many paragraphs of explanatory and descriptive material formerly set off with small black flags. In this edition, such material is set in smaller type and the flags deleted. Other changes that will be noted by those familiar with the first edition are the updating of the lists of suggested readings, elimination of some older material, and additional work exercises. We hope it is a better as well as a newer book.

A. L. W.
H. D. E.
H. J. D.

San Jose, California
December 1973

PREFACE TO THE FIRST EDITION

Humans are curious animals. They have an intense urge to explore, and probably just as intense is their desire to explain. Explanations of children are simple and naive, and so were those of previous cultures. As more and more facts were learned and more precise observations made, a science known as chemistry developed, and we now speak of a universe made of whirling electrons, charged ions, and double spirals of DNA. Basic theories of chemistry provide a description that is concerned primarily with the structure, composition, and reactions of the matter of our universe.

This book was written for any person who wants to experience this fascinating view of our universe, either for the pleasure of expanding his own understanding or for the additional goal of completing a specific course. We have emphasized those topics necessary if the reader is to understand chemistry and to interpret more intelligently the environment—both physical and, to a lesser extent, social—in which he finds himself. Not all statements in the book will have immediate, practical applications to daily life. Such a collection of facts would train a person only for today, rather than educate him. It would leave him with no historical perspective and little ability to understand the new discoveries and new interpretations which will surely develop from our current facts and theories.

We have attempted to describe the principles of chemistry in a logical manner and amplify them with meaningful examples. We have made a particular effort to show how scientific theories are developed from observations of natural events. A textbook or course which presents only a skeletal framework, beautifully articulated as it may be, is no more inspiring than the skeleton of a famous race horse or of a beautiful woman. Equally uninspiring is a shapeless mass of material without a supporting skeleton. The skeleton of principles is definitely present throughout this book, rounded out with facts which make chemistry live.

As often as possible, observations familiar to the reader, or well-known historical experiments, have been used as a foundation for developing concepts. We have presented logical and understandable methods for writing chemical equations and performing simple calculations. Rarely have we suggested that a mathematical formula be memorized. We have emphasized the use of the periodic table for predicting properties and valences, as opposed to memorizing such facts.

We have assumed that the reader already has some acquaintance with both the physical and biological sciences, but we have not assumed that he has had any previous course in chemistry. We have limited mathematical calculations to those requiring only arithmetic and simple algebra.

This book is intended to provide an introduction to general or inorganic chemistry. It should be suitable for a one-term course that stresses general aspects of chemistry for nonscience majors. Another use we anticipate is that of providing an introductory course for chemistry or science majors who have never taken a chemistry course in high school. The numerous work exercises and problems will help prepare these persons for the standard chemistry course for which a high school course is a prerequisite.

In order to provide a book that will serve the needs of a variety of persons and allow a lecturer some choice of topics, we have deliberately included more material than can reasonably be covered in one quarter. Even semester courses will probably require elimination of some material. Paragraphs that are essentially historical or descriptive are set off by flags (◄ ►) and printed with different type.

We hope that the material in this book will stimulate our readers so they gain a new way of looking at the natural and technical world which surrounds them. We hope you, our readers, find chemistry as dynamic and intriguing as we do.

A. L. W.
H. D. E.
H. J. D.

San Jose, California
February, 1970

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