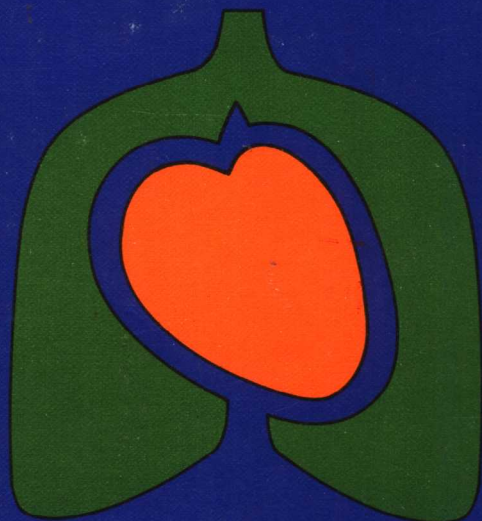
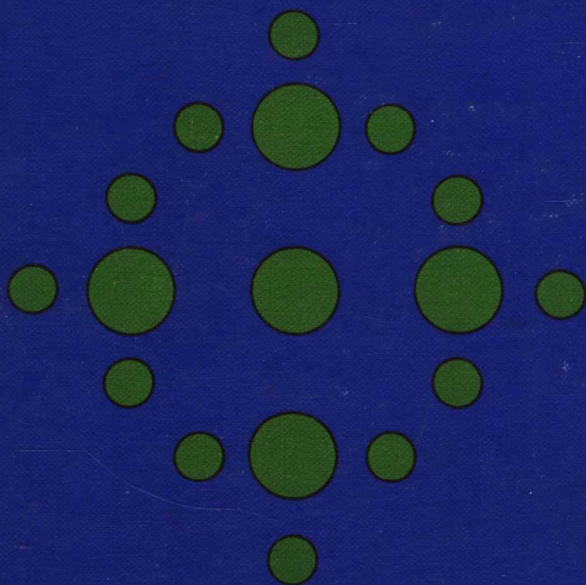
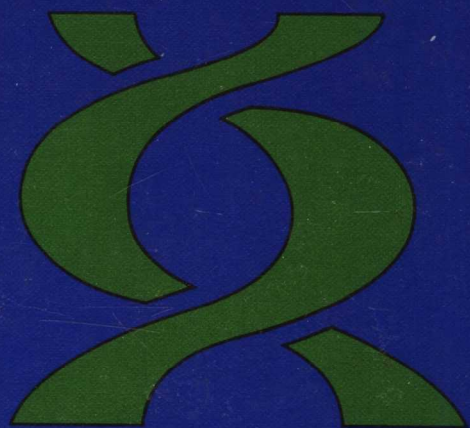


THE CHEMICAL BASIS OF LIFE



General, Organic, and Biological Chemistry for the Health Sciences

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PREFACE

I have written this text for use by students preparing for careers in the health sciences, such as nursing, medical laboratory technology, dietetics, health and physical education, and dental hygiene. It also provides the necessary chemistry background for students in community health, home economics, and the liberal arts. No previous course in the sciences is assumed.

The central theme of this text is that living systems are practical examples of the chemical principles that are discovered in the chemical laboratory. To emphasize this point, examples from living systems are used extensively to illustrate basic chemical principles. For example, breathing is presented as a practical example of the gas laws. Acid-base balance in the blood is used as an example of the basic principles of acid-base chemistry. Metabolic diseases and the action of drugs, vitamins, and hormones are discussed as examples of chemical reactions of organic compounds. A variety of other examples related to living systems are given throughout the text, in the examples, and in the exercises.

The topics are arranged in the following order. The first ten chapters cover the basic principles of general chemistry. The next nine chapters present the major functional groups of organic compounds; each of these nine chapters contains a section on naming, physical properties, and biologically important chemical reactions. Several chapters include optional sections (which can be omitted without loss of continuity) on the mechanisms of organic reactions.

Once the biologically important reactions of organic compounds con-

taining only one functional group have been covered, polyfunctional compounds are introduced in Chapter 20. This prepares the student for the following four chapters, which introduce the major types of biologically important compounds: carbohydrates, lipids, proteins, and enzymes. Finally, these compounds and the chemical reactions learned in Chapters 11 through 19 are brought together and are applied to metabolism in the last five chapters. Extensive cross-references in these chapters emphasize the important point that *most of the chemical reactions of living systems are examples of the reactions of the major functional groups of organic compounds.*

Numerous study aids are provided for the student. New terms are italicized when they are first defined. These terms and their definitions, new concepts, any new chemical reactions, and a summary are given at the end of each chapter. Exercises are placed at appropriate places in the text and at the end of each chapter. The answers to all in-chapter exercises appear at the back of the book. Frequent cross-references throughout the text help the student tie together related concepts and facts found in different sections of the text. The Appendix provides a review of basic mathematics.

A study guide is available for this text. It includes detailed solutions to the exercises in the text as well as additional exercises. An accompanying laboratory manual and instructor's reference manual are also available.

G. H. S.

ACKNOWLEDGMENTS

In writing this book I have benefited greatly from the comments and suggestions of many colleagues and students. I wish to express my appreciation to Sara Chambers, Professor M. Bersohn, and Professor R. Kluger for detailed and thoughtful reviews of various sections of the book. Special thanks are due Snezana Dalipi and Wai-Fun Chan for their tireless efforts through the various stages of proofreading and to Claudette Garipy and Ann Young for their excellent work in typing the manuscript. I have been aided by the many detailed suggestions received from reviewers: Geoffrey Davies, Northeastern University; Sam Milosevich, University of Wisconsin—Milwaukee; Richard G. Pflanzner, Indiana University School of Medicine, Indianapolis; and Marlene Spero, Loretto Heights College.

I am especially grateful to Coleen Dean for her constructive criticism, invaluable advice, and moral support.

Converting the author's manuscript into the final textbook required the dedication of a number of people at Little, Brown and Company. I am indebted to editors Ann West and Julie Stillman for their continued enthusiasm, advice, and attention to detail, to Clif Gaskill for expertly solving the multitude of production problems, and to Katharine Tsioulcas, Janet Olsen, Priscilla Hurdle, and Nancy Mimeles Carey for their outstanding copyediting.

G. H. S.

TO THE STUDENT

This text is written to help you learn chemistry. It will help you by presenting chemistry in a clear, logical, and orderly way. The sections within each chapter are organized so that one subject leads smoothly and logically to another. Your progress in learning chemistry depends in large part on your mastering each concept or principle as it is presented. To help you do this, a number of study aids are provided.

New terms are italicized when they are first defined. In addition, all new terms and their definitions are given at the end of each chapter, together with a list of the new concepts and any new chemical reactions. Each chapter has a summary at the end. Read the chapter summary after you have finished studying the chapter to be sure you have understood all the essential points. You may also find it helpful to read the summary to get an overview before studying a chapter.

The most important study aids in the text are the exercises. There are exercises within many sections of every chapter. Do all the exercises pertaining to a section to test your understanding of the material before going on to the next section. Additional exercises are given at the end of each chapter. Solve these as well. The best way to understand and learn to apply a chemical principle is to solve a number of exercises that require the application of that chemical principle. It is not sufficient simply to follow an example and its worked-out solution in the text or in class. You must be able to solve the exercise—in the chapter and at the end of the chapter—yourself. Only then can you be confident of your knowledge of the material in that chapter. The answers to the in-chapter exercises are given at the end of the text. Detailed

solutions to all the exercises are given in the study guide, which offers additional exercises as well.

Anyone learning a new subject finds it difficult to see interrelationships and general principles. The text contains frequent cross-references to help you tie together related concepts and facts found in different sections of the text. The Appendix presents a brief mathematical review. If you have any doubts about your ability to handle the mathematical skills needed in this text, you should read the Appendix and do the Appendix exercises. The extensive index at the end of the book should also prove useful.

In this text I have tried to help you understand chemistry and show you the importance of chemistry to all living systems. How successful I have been will be determined by you, the student who uses this text. Your comments and suggestions are always welcome.

G. H. S.

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