

Fundamentals of Organic Chemistry 4th



Fundamentals of Organic Chemistry

Fourth Edition

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I wrote this book for a very simple reason: I love writing. I get great satisfaction from taking a complicated subject, turning it around until I see it from a new angle, and then explaining it in simple words. I write to explain chemistry to students today the way I wish it had been explained to me years ago.

The enthusiastic response of both students and faculty to the three previous editions has been very gratifying and suggests that this book has served students well. I hope you will find that this fourth edition of *Fundamentals of Organic Chemistry* builds on the strengths of the first three and serves students even better. I have made every effort to make this fourth edition as effective, clear, and readable as possible; to show the beauty and logic of organic chemistry; and to make the subject enjoyable to learn.

Organization and Teaching Strategies

The primary organization of this book is by functional group, beginning with the simple (alkanes) and progressing to the more complex. Within this primary organization, however, there is also an emphasis on explaining the fundamental mechanistic similarities of reactions. This emphasis is particularly evident in the chapters on carbonyl-group chemistry (Chapters 9–11), where mechanistically related reactions like the aldol and Claisen condensations are covered together. Memorization is minimized and understanding maximized with this approach.

Reaction Mechanisms

In the first edition, I introduced an innovative vertical format for explaining reaction mechanisms that met with an enthusiastic response. Now set off by color panels, mechanisms shown in this format have the reaction steps printed vertically while the changes taking place in each step are explained next to the reaction arrow. This format allows the reader to see what is occurring at each step in a reaction without having to jump back and forth between structures and text. Pages 115 and 240 show examples.

Basic Learning Aids

Clarity of explanation and smoothness of information flow are crucial requirements for any textbook. In writing and revising this text, I consistently

aim for summary sentences at the beginning of paragraphs, lucid explanations, and smooth transitions between paragraphs and between topics. New concepts are introduced only when they are needed—not before—and are immediately illustrated with concrete examples. Frequent cross-references to earlier material are given, and numerous summaries are provided to draw information together, both within chapters and at the ends of chapters. In addition, the back of this book contains a wealth of material helpful for learning organic chemistry, including a large glossary, an explanation of how to name polyfunctional organic compounds, and answers to most in-text problems. For still further aid, an accompanying *Study Guide and Solutions Manual* gives summaries of reaction mechanisms and of methods for preparing functional groups, a list of named reactions with examples, and a list of the uses of important reagents.

Features of the Fourth Edition

The primary reason for preparing a new edition is to keep the book up-todate, both in its scientific coverage and in its pedagogy. My overall aim has been to retain and refine the features that made earlier editions so successful, while adding new ones.

- Full color has now been added throughout the text, both for its visual appeal and for its pedagogical value in highlighting the reacting parts of molecules.
- The writing has again been revised at the sentence level, paying particular attention to such traditionally difficult subjects as stereochemistry and nucleophilic substitution reactions.
- The artwork has been redone, and many new computer-generated models have been added. Figures frequently present structures in several different formats, side by side, so that students learn structures thoroughly and become used to the various ways chemists graphically represent their work. Look at pages 14 and 63 to see some examples.
- **Stereo views** of computer-generated ball-and-stick molecular models have been added as an aid for three-dimensional perception. A stereo viewer is bound into the back of the book. Even the problems make use of stereo views. Some examples appear on pages 184 and 230.
- The organic chemistry of metabolic pathways is presented in Chapter 17. Several of the most important pathways—glycolysis and the citric acid cycle, for example—are dissected and analyzed according to the organic reaction mechanisms by which the various steps occur. This chapter will be of particular interest to the large number of students in health sciences who traditionally take this organic chemistry course.
- Interlude boxes at the end of each chapter present interesting applications of organic chemistry relevant to the main chapter subject. Including several topics from science, medicine, and day-to-day life, these

applications enliven and reinforce the material presented in each chapter. Some Interlude topics address environmental concerns and examine popular assumptions about chlorinated organic compounds or chemical toxins in our food and water. Other Interludes discuss such topics as antibiotics and antiinflammatory agents.



- **Biologically important organic reaction mechanisms** are specially identified by the use of a margin icon. Students often wonder about what topics are "important," and this icon helps students in the biological sciences answer that question. See pages 293 and 366, for example.
- **Spectra** are all new. They have been redrawn for clarity and accuracy. Some examples appear on pages 420 and 427.
- **New problems** have been added at the end of each chapter. Some are a new kind of problem called **Visualizing Chemistry**, in which students are challenged to make the connection between typical line-bond drawings and computer-generated molecular models. See pages 35 and 215, for example.

To facilitate the changes outlined above, some material from the previous edition has been compressed, several reactions (such as ozonolysis) that have little relevance to biological chemistry have been deleted, and other material has been rearranged.

Acknowledgments

I sincerely thank the many people whose help and suggestions were so valuable in preparing this fourth edition, particularly Phyllis Niklas, Jamie Sue Brooks, Beth Wilbur, and Harvey Pantzis. It is a real pleasure to work with such consummate professionals.

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Study Guide and Solutions Manual

by Susan McMurry

- Includes solutions to all end-ofchapter problems, detailed explanations of how answers are obtained, and skills to master for each chapter.
- Also contains a summary of general reaction mechanisms, a summary of methods for preparing functional groups, and a summary of the uses of important reagents.

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A Note for Students

We have similar goals. Yours is to learn organic chemistry; mine is to do everything possible to help you learn. It's going to require work on your part, but the following suggestions should prove helpful:

Don't read the text immediately. As you begin each new chapter, look it over first. Read the introductory paragraphs, find out what topics will be covered, and then turn to the end of the chapter and read the summary. You'll be in a much better position to understand new material if you first have a general idea of where you're heading. Once you've begun a chapter, read it several times. First read the chapter rapidly, making checks or comments in the margin next to important or difficult points; then return for an in-depth study.

Keep up with the material. Who's likely to do a better job—the runner who trains five miles per day for weeks before a race, or the one who suddenly trains twenty miles the day before the race? Organic chemistry is a subject that builds on previous knowledge. You have to keep up with the material on a daily basis.

Work the problems. There are no shortcuts here. Working problems is the only way to learn organic chemistry. The practice problems show you how to approach the material, the in-text problems provide immediate practice, and the end-of-chapter problems provide additional drill and some real challenges. Answers and explanations for all problems are given in the accompanying *Study Guide and Solutions Manual*.

Ask questions. Faculty members and teaching assistants are there to help you. Most of them will turn out to be extremely helpful and genuinely interested in seeing you learn.

Use molecular models. Organic chemistry is a three-dimensional science. Although this book uses many careful drawings and stereo views to help you visualize molecules, there's no substitute for building a molecular model, turning it in your hands, and looking at it from different views.

Use the study guide. The Study Guide and Solutions Manual that accompanies this text gives complete solutions to all problems and provides

a wealth of supplementary material. Included are a list of study goals for each chapter, outlines of each chapter, a summary of name reactions, a summary of methods for preparing functional groups, a summary of the uses of important reagents, and tables of spectroscopic information. Find out ahead of time what's there so that you'll know where to go when you need help.

Good luck. I sincerely hope you enjoy learning organic chemistry and that you come to see the logic and beauty of its structure. I would be glad to receive comments and suggestions from any who have learned from this book.

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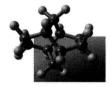
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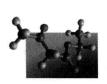
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