

Organic Chemistry

Alma S. Wiegrove

Robert L. Caret

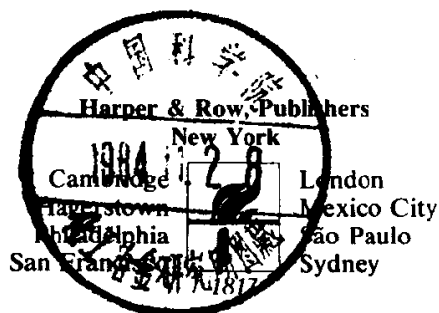
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ORGANIC CHEMISTRY

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Preface

The inception, formulation, and eventual birth of a new textbook is an evolutionary process, beginning with a need by the author, a need for something better for the students. Upon beginning this project we felt that such a need existed, a text that was better organized and more coherent than currently available texts and written in a style students could both understand and find pleasant. This book is a result of our efforts to attain that goal.

Organic Chemistry is designed and written to be a comprehensive one-year text that can be used with equal facility in courses for chemistry majors, biological science students, and preprofessional students in the medical, dental, and pharmaceutical fields. The text provides a solid background in classical organic chemistry, and the numerous examples of organic compounds of current interest, concern, and/or biochemical importance provide special appeal to the students in the various disciplines.

The text is *written for the student*, in a clear and understandable style, and we made every effort to incorporate detailed explanations of the material so students can use the book on their own. Many published texts assume that students can read between the lines and understand the concepts being put forth; but this is not always true. The real key to studying and learning organic chemistry is a clear and coherent organization. The highlights of the organizational features of this text include:

Functional Group Approach

Organic Chemistry uses the functional group approach, which eliminates the needless repetition and discontinuity of thought that often arises in other texts. For example, we grouped alkanes and cycloalkanes (Chapters 3 and 4), alkenes and alkadienes (Chapters 7 and 8), and atomic and molecular structure (Chapter 2). Also, because the coverage of hydrocarbon chemistry has been reduced, other functional groups (alkyl halides in Chapter 9 and alcohols in Chapter 10) can be easily presented in the first semester. This provides a much more equitable distribution of the material between the two semesters than other texts.

Study Hints

Study hints and other suggestions for study methods that may be potentially useful in helping students succeed and avoid common pitfalls are presented throughout the text. Examples of these highlights, set off by color, include "How To Approach Organic Synthesis," "How To Study Organic Chemistry," "Flash Cards in Organic Chemistry," "How To Draw Resonance Structures," Oxida-

tion and Reduction in Organic Chemistry," "Reactive Intermediates," and "Electrophiles and Nucleophiles." A complete list appears in the Contents of the Study Guide.

Atomic and Molecular Structure

Atomic and molecular structure and molecular orbital theory are presented together in Chapter 2, and the various hybridizations of carbon are developed simultaneously in that chapter. The similarities and differences among these topics can thus be contrasted more readily, to avoid repetition and review in future chapters. For those instructors who choose not to discuss molecular orbital theory, we have separated the theory from the more qualitative discussions of bonding in Chapter 2. Thus, either the qualitative or/and the more theoretical approach to bonding can be taught since they appear in separate sections in the chapter.

Hydrocarbon Chemistry

Numerous modern texts dwell on hydrocarbon chemistry, often to the extent that the first-semester course seldom covers much beyond aromatic chemistry. We reduced the coverage of alkane chemistry, but we still hit the important highlights and introduce the basic concepts that evolve from them. This allows for the coverage of other functional groups, such as alkyl halides (Chapter 9) and alcohols (Chapter 10) in the first semester, permits greater flexibility in the second semester, and gives a better foundation for the laboratory portion of the course.

Mechanisms and Reactive Intermediates

Reaction theory and reaction mechanisms are first introduced and discussed together in Chapter 5, Reaction Mechanisms; nucleophilic aliphatic substitution is also introduced there. Product distribution, the effect of temperature and concentration, the use of stereochemistry, kinetics and isotope labels, and other experimental tools are discussed from the standpoint of explaining how reaction mechanisms are elucidated. The structure of carbocations, carbanions, carbon radicals, and carbenes are all presented in Chapter 2, and in Chapter 5 their relative stabilities, methods of formation, and reactions are contrasted. This material provides a strong foundation for the use of reaction mechanisms throughout the remainder of the text.

Spectroscopy

The spectroscopy material is presented in three separate chapters. Chapter 12 covers infrared and ultraviolet spectroscopy and follows the chapters on alkanes, alkenes, and alkynes; Chapter 15 covers nuclear magnetic resonance and follows aromatic chemistry; and Chapter 18 covers mass spectrometry and follows the aryl halides and phenols. This spreads out the material and gives students time to think about and use their newly gained knowledge of spectral techniques before delving into another technique. Once introduced, spectroscopy is integrated throughout all the subsequent chapters. This building-block ap-

proach provides a sound background in both the understanding and use of spectral methods.

Relevant Examples

Numerous relevant examples of organic compounds of bioorganic, medicinal, industrial, and environmental interest abound throughout the text, including sections on sweeteners, smog, soaps and detergents, natural products, prostaglandins, paints, and polymers. Complete chapters dealing with proteins (Chapter 28) and carbohydrates (Chapter 29) are also included. All these examples are grouped by area and listed in the Contents of the Study Guide.

Summaries

Many summaries of important material are included to help the student, such as summaries of K_a 's, K_b 's, spectral data, nomenclature, and bond energies. A summary of reactions follows each chapter; a complete reaction summary is compiled in the Study Guide.

Study Problems and Reading References

The text contains more than 900 problems of varying difficulty with over 3000 parts. About 50 percent of these problems are incorporated into the text as questions; about 50 percent are end-of-chapter study questions. Unlike most of the other texts in this field, this text's problems are written for the students—they are the type of problems instructors write for their own exams—and will provide a great deal of needed and useful practice. Reading references are presented in the appendix. Most of these references are from the *Journal of Chemical Education* and can be read and understood by the beginning student; selected textbooks are also listed whenever appropriate.

Study Guide and Answer Book

The Study Guide contains (1) a detailed answer for each problem, (2) a complete summary of nomenclature, (3) a complete summary of all reactions in the text, and (4) lists of relevant sections from the text by area (for example, industrial chemistry, bioorganic chemistry, medicinal chemistry, and environmental chemistry). The Study Guide will be very useful and invaluable to students as an aid in understanding and mastering organic chemistry.

Acknowledgments

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And finally, we express our indebtedness to our students who gave us the reason for beginning, the courage to continue, and the fortitude to complete the project.

We are sincerely grateful to them all.

Alan S. Wingrove
Robert L. Caret

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Organic Chemistry

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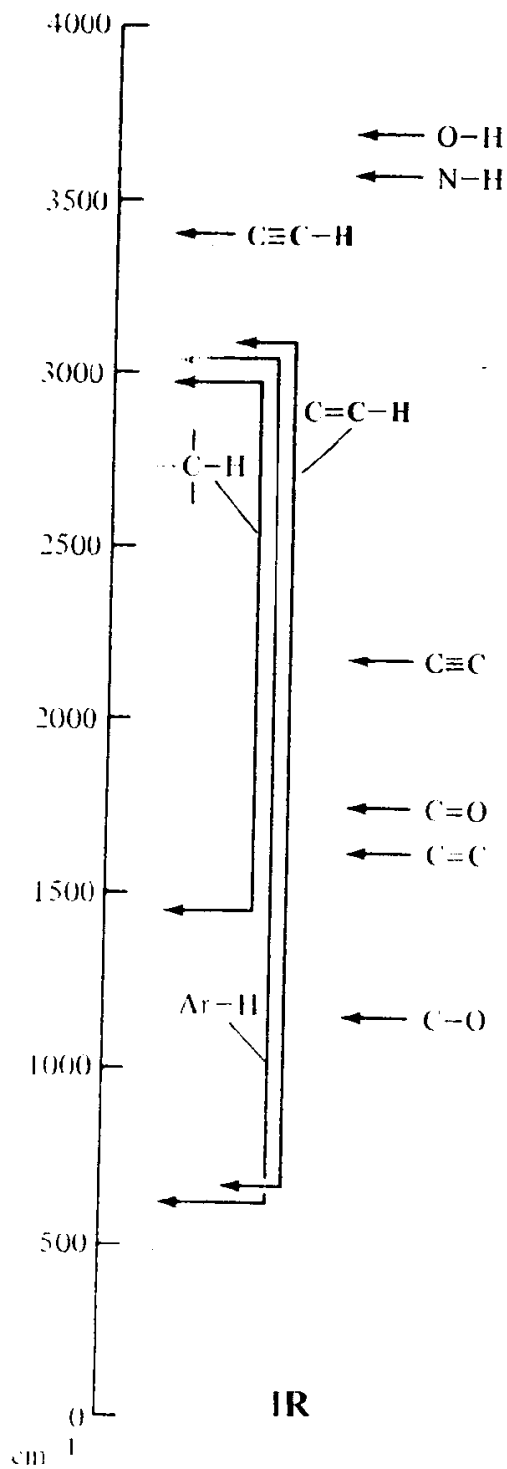
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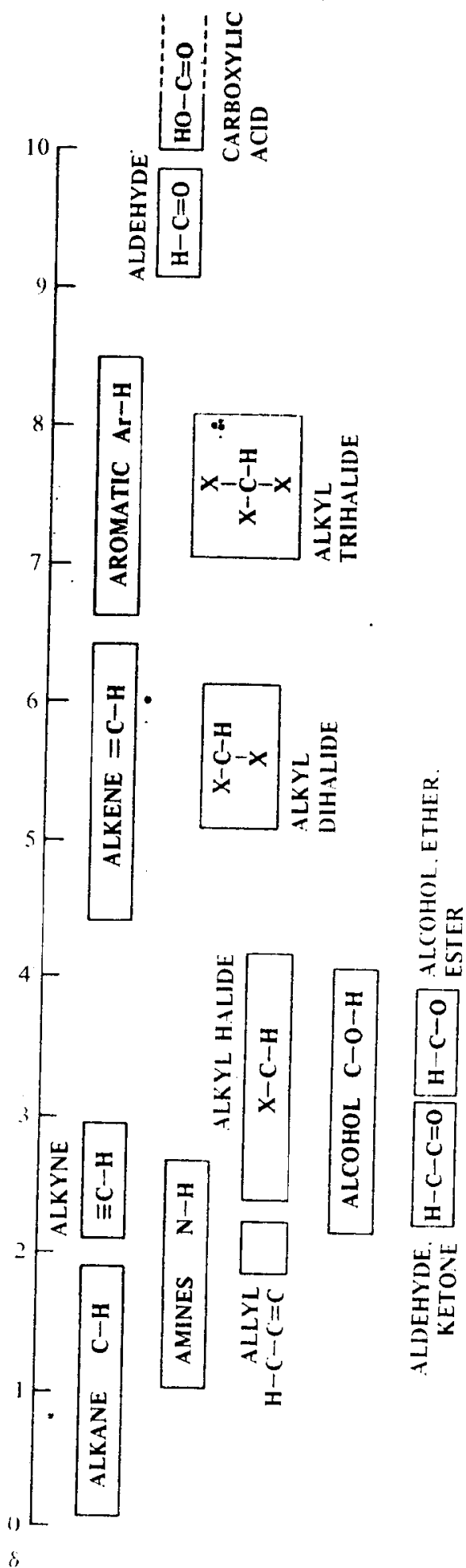
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NMR



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