

## Organic Chemistry

When you first approach *Organic Chemistry*, authored by David Klein (Johns Hopkins University), you will immediately be drawn to the artistic and visually appealing nature of the book and its concepts. In this textbook, David Klein has established an integrated skills-based approach that builds from the strategy introduced in his previous companion book, *Organic Chemistry as a Second Language*. While this type of skills-based approach is often utilized by instructors in classrooms, this textbook provides a fresh look to the strategy and appears to be one of the first to present this strategy as a systematic approach throughout the textbook.

Before embarking on the skills and concepts in each colorful chapter, Klein starts by posing a “Did you ever wonder ...” question that connects to the topics and applications to be covered. These questions provide an engaging start to each chapter that are sure to be interesting to students as well as readers who are already familiar with the concepts. Each chapter then proceeds to integrate numerous commercial and medical applications that focus on pharmacology and medicinal chemistry, entitled “Medically Speaking” and “Practically Speaking”. These applications extend beyond a small textbox, typically ranging from 1–3 pages. Each one includes colorful images and mechanistic details, and the application is often connected to more advanced questions as conceptual checkpoints.

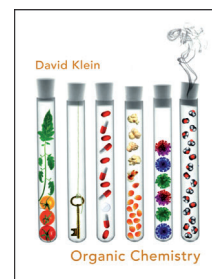
Examples of “Medically Speaking” applications include “Pharmacology and drug design”, “The role of molecular rigidity”, and “Nitroglycerin: an explosive with medicinal properties”. An example in Chapter 7 (substitution reactions) showcases how a theme is established between the introduction and applications in a chapter. This chapter starts with “Did you ever wonder ... what chemotherapy is?” Then one of the more developed applications is the “Medically Speaking: Pharmacology and Drug Design” application, which presents the sulfur mustard story and the rational design of chemotherapy drugs. Although this is a topic presented in many textbooks, Klein presents a very thorough theme that also integrates the discussion of water solubility, resonance structures, how delocalized electrons effect pharmacology, and concludes with a “conceptual checkpoint” question about the mechanism of a nucleophile reacting with melphalan, a phenylalanine derivative of nitrogen mustard used as a current chemotherapy drug.

Examples of practically speaking applications include “Do living organisms violate the second law of thermodynamics?”, “conducting organic poly-

mers”, and “What are those colors in fruity pebbles?” These applications, along with their colorful images and specific details, are equally creative and engaging. As such, I have found them interesting and useful to incorporate as details in other courses. I have often considered how this collection of applications would be engaging to combine into its own book as a companion resource to accompany other courses, or serve as the foundation for a series of case studies that could be presented to students in a highly engaging manner.

Similar to many textbooks, this book is organized into 27 chapters representing a standard and logical flow. The book follows the traditional approach of functional groups, but maintains a strong emphasis on mechanism, with all steps fully illustrated including proton transfer steps. Unique from many textbooks, there are several chapters that independently deal with resonance structures, mechanisms and synthesis strategy, which further emphasize the skill-building approach. For example, Chapter 2 covers standard molecular representation while also covering resonance structures and drawing resonance contributors with great depth, much earlier than many textbooks. Chapter 6 is solely devoted to chemical reactions and mechanisms (energetics, nucleophiles and electrophiles, patterns of arrow pushing, drawing curved arrow mechanisms, etc.) with a special section for carbocation rearrangements. This chapter emphasizes skill-building with numerous opportunities to practice reading and drawing curved arrows, even before students have seen many of the different reactions, in order to help them develop skills of following arrows and electron motion. Chapter 12 is solely devoted to synthesis, including retrosynthetic analysis. There are also chapters covering the traditional biochemistry topics and Chapter 27 covers the topic of synthetic polymers, all continuing to utilize the skill-building approach.

I must admit that I was initially concerned that the textbook may have too much of a focus on applications, and not enough advanced material. However, upon looking for a few of my favorite advanced topics, such as pericyclic reactions and asymmetric catalysis, I found that they were artfully included within the context of other chapters and sections where they could be used to develop the skill-building strategy. I found that Chapter 9 (Addition reactions of alkenes) contains a well-developed section on catalytic hydrogenation, which also includes an excellent introduction to asymmetric catalysis with a discussion of Wilkinson's catalyst and Knowles' idea to use chiral phosphine ligands. Figure 9.8 has the essential energy diagram comparing the catalyzed and uncatalyzed pathway, including the ability of a chiral catalyst to favor formation of one enan-



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tiomer over the other. This section also introduces the structure and use of (*S*)-(–)-BINAP as a chiral ligand. The consistent incorporation of integrated and challenge problems at the end of each chapter also expose students to more advanced questions focusing on synthesis and mechanism. In this way, an instructor should be able to tailor the use of the textbook for several types of undergraduate chemistry courses.

In summary, I would encourage all chemists to explore this book, whether you are interested to evaluate it as an instructor for an undergraduate

course or to personally enjoy the artistic and creative applications presented. Just as Chapter 19 promises to “paint Fruity Pebbles in a whole new light”, this book will engage students of all ages by painting organic chemistry with a fresh look on a solid foundation of skills.

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