Organic Chemistry

With a Biological Emphasis

Volume I: Chapters 1-9

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Notes to the reader:

- This textbook is meant to be a constantly evolving work in progress, and as such, feedback from students, instructors, and all other readers is greatly appreciated. Please send any comments, suggestions, or notification of errors to the author at soderbt@morris.umn.edu.

- If you are looking at a printed version of this textbook, please be aware that most of the figures throughout contain color. Although they are intended to be understandable in black and white, it may often be very helpful to download (for free!) a pdf version of the text at lulu.com in order to refer to the color figures.

- An online version of this textbook is accessible as part of the **Chemwiki** project at the University of California, Davis: http://chemwiki.ucdavis.edu/Organic_Chemistry/Organic_Chemistry_With_a_Biological_Emphasis

- *Where is the index?* There is no printed index for this textbook. However, an electronic index is available simply by opening the digital (pdf) version of the text (download it for free at lulu.com) and using the 'find' or 'search' function of your pdf viewer.

Table of Contents

Volume I: Chapters 1-9

Chapter 3: Conformations and Stereochemistry

Chapter 4: Structure determination part I: Infrared spectroscopy, UV-visible spectroscopy, and mass spectrometry

Chapter 7: Organic compounds as acids and bases

Chapter 8: Nucleophilic substitution reactions part I

Chapter 9: Nucleophilic substitution reactions part II

Tables

Volume II: Chapters 10-17

Chapter 12: Acyl substitution reactions

Chapter 13: Reactions with stabilized carbanion intermediates, part I - isomerization, aldol and Claisen condensation, and decarboxylation

Tables

Introduction

As you begin a course in organic chemistry, you probably have many questions. Here are my attempts to answer a few of the questions that you are most likely to be wondering about.

What is organic chemistry, and why do I need to study it?

As you probably already know, organic chemistry is defined as the study of molecules that contain the element carbon. If you are interested in the science of living things, then you are also interested in organic chemistry - organic molecules and the reactions they undergo form the basic currency of life on earth. You cannot understand how a human cell breaks down carbohydrate or fat for energy without gaining a solid understanding of the basic processes of organic chemistry that underlie these metabolic events. You cannot appreciate how drugs work, on a molecular level, until you have first learned about the three dimensional structure of organic molecules and how different organic 'functional groups' interact with one another. And if you don't know your organic chemistry, you will have difficulty understanding and explaining the molecular underpinnings of diseases such as depression, cancer, or diabetes.

The relevance of organic chemistry is not restricted to the study of living systems, however. You need a firm grasp of the subject to understand many ongoing developments in renewable energy, nanomaterials, environmental clean-up, and drug development and regulation, just to name a few examples. Society always has - and probably always will - need people who know how to synthesize, analyze, and break down organic molecules in useful ways, and this need translates to rewarding careers with good salaries and working conditions.

How is organic chemistry going to be different from general chemistry?

Depending on your experience with general chemistry, you may be pleased (or dismayed) to learn that most students find organic chemistry to be an entirely new breed of beast. It is common to see students, who felt very much at home with general chemistry, struggle with organic – and vice versa.

To begin with, an introductory course in organic chemistry tends to focus much more on the qualitative than it is does on the quantitative (translation – there much less math!) But don't get too comfortable just yet – despite its scarcity of math, you undoubtedly are aware that very few people find organic to be an easy course. In fact, many science and pre-health majors report that it was for them the single most challenging part of their undergraduate career. You are going to be asked to take in and digest a lot of new