



Chem 843: Electron Pushing Mechanisms in Organic Chemistry

Fall 2009

Instructor: Laura L. Kiessling (kiessling@chem.wisc.edu)

Location: Room 2373 Chemistry

Time: M/W 12–1:10 pm

Required Reference Book

Robert B. Grossman, *The Art of Writing Reasonable Organic Reaction Mechanisms*, 2nd Ed. Springer, c2003. Book website (with answers to problems):

<http://www.chem.uky.edu/research/grossman/textbook.html>

We will not follow this book in the course; it was chosen to serve as a reference for you.

Recommended Reference Books (on reserve in the Chemistry Library)

Francis A. Carey and Richard J. Sundberg, *Advanced Organic Chemistry Part B*, QD251.2 C36 2000. (Good for basic information on organic chemistry reactivity and reactions.)

Fleming, Ian, *Frontier orbitals and organic chemical reactions*, London ; New York : Wiley 1976, QD461 F53

Anthony J. Kirby, *Stereoelectronic Effects*, Oxford University Press, c1996. (Good overview of stereoelectronic effects).

Online Resources

There is useful information on the organic division website:

<http://www.chem.wisc.edu/areas/organic/content-chem.HTM>

For general introduction to arrow pushing see the links below:

<http://www.chem.wisc.edu/areas/reich/Handouts/ElecPush/ep-basecatalysis.HTM>

<http://www.chem.wisc.edu/areas/reich/handouts/ElecPush/epush-1.HTM>

Course Objectives

The purpose of this course is to teach you how to draw a reasonable mechanism for an organic transformation. A major objective is to familiarize you with common reactivity pathways and the factors that influence them. Another course goal is for you to become familiar with the chemical information resources here on campus. Learning how to effectively search the chemical literature is essential for any accomplished chemist.

Course Structure

This course will be informal and interactive. A typical course period may contain a short lecture, followed by group work and students presenting their solutions to problems. Every student is required to put problems on the board and explain them throughout the semester. Volunteers are welcome – everyone goes once, then twice, etc.

- *Problem sets.* Problem sets will be handed out almost every week. The due date will be indicated at the top of the assignment (most likely due one week later). *Please make a copy of your problem set* to hand in at the beginning of the class period – keep the original for discussion during class that day.

- *Collaboration.* The problems used in this course are taken from the literature. DO NOT look up answers to these problems in the chemical literature. It will deprive you of the benefits of struggling to figure out the answer. Also—you will miss the great feeling of figuring something out on your own (the fun part of the course). Indeed, you should make a concerted effort to solve all of the problems on your own, as everyone in the course is responsible for the material covered. Nevertheless, I hope that the problems will engender interest and discussion amongst class members. If collaborations arise, please give credit to classmates at the top of each of the relevant problems.
- *Solutions.* Answers to the problem sets will be discussed in class, and answers for selected problems will be posted in a cabinet in the basement of the Chemistry building near the organic teaching labs.

General Outline of Course Topics

1. Review of basic concepts
2. Factors governing reactivity
 - a. Stereoelectronic effects
 - b. Conformation
3. Polar reactions under basic conditions
 - a. Substitution/Elimination
 - b. Carbonyl chemistry and enolates
 - c. Base-catalyzed rearrangements
4. Polar reactions under acidic conditions
 - a. Carbocations
 - b. Substitution/Elimination
 - c. Addition/Substitution
5. Pericyclic Reactions
6. Potential Additional Topics (Radical, Metal-Promoted Reactions, etc)

Grading

Your final course grade will be based on the following criteria

Completion of the problem sets (10, plus 2 'question' sets)	40%
Class participation (thus, your attendance each class period is critical)	10%
Performance on 3 cumulative exams	50%