

CHEM 543 - ORGANIC CHEMISTRY III ORGANIC REACTION MECHANISMS

Course Syllabus - 2013

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Course Goals: Modern organic chemistry depends on the ability to understand how and why molecules react. This course will provide an essential foundation for understanding both organic synthesis and modern physical-organic chemistry. Reaction mechanisms provide the basis for this understanding. There are six specific goals for the course.

- 1) You will learn approximately 50 established organic reaction mechanisms.
- 2) You will learn "electron pushing" concepts.
- 3) You will learn how to apply acid/base concepts to reaction mechanisms.
- 4) You will learn the rudiments of molecular orbital theory and how to apply the theory to reactions.
- 5) You will learn about qualitative electronic effects and semi-quantitative correlations.
- 6) You will learn how to determine mechanisms for newly discovered reactions.

Required Text: "Advanced Organic Chemistry"; M. B. Smith & J. March; 6th edition preferred, older edition acceptable. Note that the 7th edition will be released shortly but not in time for this class.

Grading: a total of 250 pts divided as follows:

- 1) assigned problems: - 50 pts
- 2) midterm - 100 pts
- 3) final - 100 pts

Course Contents

1. Introduction - Basic concepts, ester hydrolysis.
2. Acids and bases, introduction to electronic effects.
3. Bimolecular substitution at tetrahedral (sp^3) carbon – the S_N2 reaction
4. Basic orbital theory: antibonding orbitals and attack trajectories at sp^3 centers.

5. Nucleophilicity: hard-soft acid-base theory.
6. The S_N1 reaction and other typical carbocation processes.
7. Neighboring group effects.
8. Substitution with accompanying rearrangement, allylic systems and the S_N2' reaction.
9. β -Eliminations - E2, E1cb, E1, Ei, and related fragmentation reactions.
10. Carbonyl addition mechanisms - attack trajectories at SP^2 centers.
11. Rearrangements involving carbonyl groups: Favorskii and benzilic rearrangements.
12. Ylides - Stevens rearrangement.
13. Structure-activity relationships, more on electronic effects.
14. Free radicals - back-bite processes, Barton reaction, radical cyclizations.
15. Radical – radical anion substitution reactions.
16. Carbene, metalcarbene, and carbenoid processes: basics of carbenes, Simmons-Smith reaction, alkene metathesis.
17. Orbital Theory and its application to concerted mechanisms.
18. Diels-Alder and dipolar cycloaddition reactions.
19. [3,3]-sigmatropic rearrangements: Claisen and Cope rearrangements.

Academic Policies

Plagiarism and Cheating will not be tolerated. For more information, see the following links:

http://www.drexel.edu/provost/policies/academic_dishonesty.asp

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If you are registered and wish to drop this course, see the following link:

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The list of topics and the exam schedule may be modified after the term begins. If such changes are made, your Instructor will inform you during class and on Bb Learn.