

CHEM 243-002 Majors Section

Organic Chemistry III

Course Syllabus - September 2013

Course Description: This course is a continuation of CHEM 242 for chemistry majors. Here you will learn about the chemistry of aldehydes, ketones, amines, carboxylic acids, and acid derivatives: these are important classes of chemicals in the pharmaceutical and polymer industries. Reaction mechanisms and carbon-carbon bond forming reactions that are essential to modern organic chemistry will be covered.

Course Objectives: This course completes a solid foundation in the fundamentals of organic chemistry essential for all practicing chemists:

- 1) Learn nomenclature of aldehydes, ketones, amines, carboxylic acids, and acid derivatives.
- 2) Learn methods to prepare aldehydes, ketones, amines, carboxylic acids, and acid derivatives.
- 3) Learn standard reactions of aldehydes, ketones, amines, and carboxylic acids.
- 4) Learn standard reactions and interrelationship of acid derivatives including amides, esters, anhydrides, and acid halides.
- 5) Learn some common mechanisms (arrow pushing) for reactions of carbonyl compounds, amines, and acid derivatives.
- 6) Learn spectroscopic methods of characterizing aldehydes, ketones, amines, carboxylic acids, and acid derivatives.
- 7) Learn the chemistry of enolates and its application to C,C-bond formation
- 8) Learn about coupling reactions used for C,C-bond formation

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Required Text: "Organic Chemistry", 8th edition (older edition, see P. Wade) L. G. Wade, Jr.

Recommended Supplements: any "Molecular Model Set" with at least 10 carbon atoms. "Solutions Manual" to accompany the textbook; 8th edition: J. W. Simek.

Archived Lecture Notes: Will be made available through Bb-Learn (video only). If you really want to learn orgo, you need to get to class and recitation on a regular basis.

Mastering Chemistry: You will need to do on-line homework on material covered in class as part of your experience.

Recitation: You will need to attend recitation to gain practice in working organic chemistry problems.

Grading: a total of 500 points divided as follows:

- 1) four in-class quizzes of 40 pts each (two low scores thrown out: no make-ups; 80 pts total). These will be given on the following dates: Oct. 7th, Oct. 16th, Nov. 11th and Dec 4th (the 3rd, 4th, 8th, and 10th weeks of the term). Quiz dates might be modified with prior in-class notice.
- 2) completed homework through Mastering Chemistry (20 pts total)
- 3) two midterm exams - 100 pts each, 5th and 9th week, Oct. 23rd and Nov. 22nd; 200 points total.
- 4) comprehensive final - 200 pts, time TBA.

Homework through Mastering Chemistry is graded. Other assigned problems are not graded but all homework problems may show up on quizzes and exams. You need to do *all* of the assigned problems and understand the answers. Exams and quizzes are based on lecture material and the assigned problems. You need to get to lecture every day or get the notes on any day that you miss class. Grades are curved, typically > 250 pts is a "C" and > 430 pts is an "A".

Course Contents

Chapter 18. Ketones and Aldehydes.

Nomenclature and properties; Enols and enolates (introduction); Sources of formaldehyde and acetaldehyde; IR and NMR spectral characterization; Preparation of aldehydes from alcohols, aromatic compounds, acid chlorides, and nitriles; Preparation of ketones from alcohols, aromatic compounds, acid chlorides, carboxylic acids, and nitriles; Wittig olefination; Hydration of aldehydes; Carbonyl addition of cyanide, amines, hydrazines, hydroxylamine, etc.; Acetal formation and hydrolysis; Protecting groups: Redox reactions of aldehydes and ketones.

Chapter 19. Amines.

Structure, nomenclature, and properties of amines; Amine salts; Basicity of amines; IR and NMR spectral characterization; (Synthesis of amines will be covered before reactions) Preparation from nitro compounds, azides, and amides; Reductive amination; Aromatic substitution reactions of aromatic amines; *N*-Alkylation, acylation, and sulfonylation reactions; Hofmann elimination; Oxidation of amines; Nitrosation (diazotization) of amines; Substitution reactions of arenediazonium salts (Sandmeyer reactions); Diazonium coupling.

Chapter 20. Carboxylic Acids.

Nomenclature, structure, and properties; Important diacids; Acidity concepts; Carboxylate salts; IR and NMR spectral characterization; Conversion to acid chlorides, esters, and amides; Reduction.

Chapter 21. Carboxylic Acid Derivatives.

Nomenclature of acid chlorides, anhydrides, esters, amides, and nitriles; Lactones and lactams; Nucleophilic acyl substitution; Interconversion of acids, acid chlorides, anhydrides, amides and nitriles; Reduction of acid derivatives; Reaction of acid derivatives with organometallic reagents; derivatives of carbonic acid; IR and NMR spectral characterization of carboxylic acids, amides, and esters.

Chapter 22. Alpha Substitutions and Condensations of Enols and Enolate Ions

Enols and enolates (extensive coverage); α -Halogenation of carbonyl compounds; Alkylation of enolates; Aldol condensations; Aldol cyclizations; Claisen condensations; Dieckmann reactions; Conjugate addition (Michael reactions).

Organometallic Coupling Reactions: C,C-Bond Formation (Chapter 17 section 13)

Organocuprates; Heck reaction; Suzuki coupling

Academic Policies

Plagiarism, cheating, fabrication and other acts of academic misconduct will not be tolerated. For more information, see material in “academic dishonesty” under the “academic policies” tab at the following link:

http://drexel.edu/studentaffairs/community_standards/studentHandbook/

Students with disabilities should see material under the “health and disability services” tab at the following link:

http://drexel.edu/studentaffairs/community_standards/studentHandbook/

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

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

The list of topics may be modified after the term begins. If such changes are made, your instructor will inform you during class. The list of quiz dates and test dates may be altered owing to unforeseen circumstances. If such changes are made, your instructor will inform you during class and will post the changes on Drexel Learn in the calendar tool.