

Organic Chemistry 336 (Fall 2016)

Meetings: M,W,F 1:00 PM - 1:50 PM

Location: La Tourette Hall 201

Instructor: Prof. Timothy J. Hagen

Office: FR 350, Office Hours: M,W 2:00-3:00 pm, Tu: 9:30-10:30 am, and by appointment

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Tentative Lecture Schedule

Lecture Dates	Chapters	Subject
8/22 - 9/14	1	Introduction and Syllabus; Chapter 1: Bonding, orbitals, structures
	2	Functional groups, forces, IR spectra
9/16		Exam 1
9/19 – 10/5	3	Acid-base chemistry, thermodynamics
	4	(Cyclo)alkanes, conformations, and nomenclature
	5	Stereochemistry
10/7		Exam 2
10/10 – 10/26	6	Substitution and elimination
	7	Synthesis of alkenes
	8	Addition reactions
10/28		Exam 3
10/31 – 11/16	9	NMR
	10	Radical reactions
11/18		Exam 4
11/21– 12/5	11	Alcohols and ethers (and maybe thiols)
12/7/16		Final exam: Wednesday December 7, Noon-1:50 p.m.

On-Line Course Information and Tools: Blackboard (<https://webcourses.niu.edu>)

Materials Organic Chemistry, 11th Ed Solomons, Fryhle, and Snyder Wiley & Sons, NY, NY
ISBN: 9781118133576

Optional texts: Student Study Guide and Student Solutions Manual To Accompany Organic Chemistry 11e / Edition 11 by T. W. Graham Solomons ISBN: 9781118147900

Recommended: Molecular Visions: Flex molecular model kit ISBN: 9780964883710

Class Format: The course will be composed of lectures, in-class exams, in-class quiz and online learning tools and assessments. *It is important that you attend class, and attendance will be taken each class period. The in-class lectures need to be supplemented by your reading of the text, working of problems.* If you miss a class, it is your responsibility to acquire the lecture notes and any assigned class work from a fellow classmate and you should check Blackboard each day for postings.

Solving the problems for each chapter, with a time limit, is good practice for the exams.

BlackBoard Access: You must know your student id login and password.
<https://webcourses.niu.edu/webapps/portal/frameset.jsp>

Exams and Grades: The course grade will be assigned based on your point totals from the exams and in-class/online quizzes. The course grade will be assigned based on your point totals from exams, quizzes and a final exam. **One exam may be dropped, and because of this no make-up exams will be given.** Under certain justified circumstances students may take tests early or late; please contact me

ahead of time to make arrangements. If an exam is missed, a score of zero will be assigned. The on-line quiz will be administered through the NIU Blackboard system. If more than ten quizzes are given then the lowest score(s) will be dropped and the best ten will be used in the grade calculation.

Final Exam: The 200 point final exam will be comprehensive and will be given on Wednesday, Dec. 7th from 12:00 - 1:50 am. The point total is as follows:

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Exams (Best 3 of 4 at 100 pts each)	300 Points
Quiz (ten at 10 pts each)	100 Points
Final exam (Wed, 12/7/16 at 12 noon-1:50 pm)	200 points
Total Points	600 Points

Approximate Grading Scale: Average grade: A (100-87%), A- (86-85), B+ (84-83), B (82-75%), B- (74-70), C+ (69-68), C (67-55%), D (54-45%), F (44-0%)

NOTE: by enrolling in this class, you are agreeing to take the exams on the scheduled dates.

Optional Study Group Sessions: I will hold an optional one-hour group study session to go over material and work through problems. The time and location will be announced in class.

Extra Credit: THERE IS NO EXTRA CREDIT AVAILABLE.

Requests for regrades will be accepted for one week after the day the exams are distributed in class. To request a regrade, list the pages and numbers of the problems that you believe were graded incorrectly along with reasons for a regrade and submit this list along with the original exam. The requests will be reviewed, and exams will be returned during the next class meeting. *The instructor may make copies of exams prior to distribution to the class.* Individuals who make submissions for re-grades will have the copy of the original exam and the exam submitted for re-grading compared. Discrepancies between the two will constitute academic dishonesty and the situation will be dealt with appropriately.

Important Dates Consult your academic adviser and the NIU website:

<http://catalog.niu.edu/content.php?catoid=25&navoid=911>

Sunday, August 30 Last day to drop course via self-service in MyNIU.

Friday, September 4 Last day to drop course with approval of major college.

Friday, September 11 Last day to change course from credit to audit or from audit to credit.

Friday, October 16 Last day for an undergraduate to withdraw from course.

Common Sense Conduct: No cell phones, pagers, ipods or similar electronic devices allowed. All cell phones must be put in silent/vibrate mode and left on for emergency alerts only. Do not talk, text, etc. during class. Be quiet and respectful of the other students desire to learn. If repeated disturbances of my lecture occur, you will be required to leave class. **During exams all electronic devices are prohibited.**

Academic Dishonesty (cheating): Academic dishonesty includes (but is not limited to) looking at another student's exam during a testing session, allowing another student to copy your work, use of unauthorized materials (e.g., lecture notes, crib sheets, textbooks, prohibited electronic devices including smart phones, cell phones, I-pads or programmable calculators containing stored equations, formulas, or text) during exams. Violation of any of these terms will result in assignment of a score of zero for the exam, quiz or assignment in question. **Academic dishonesty in any form will not be tolerated and may result in failure of the entire course.**

Student Code of Conduct: <http://www.niu.edu/communitystandards/pdf/SCC.PDF>

Study Groups: This will make your organic chemistry experience more enjoyable and you will learn the material better. Research shows that by teaching someone else you will learn the material better and you will get a realistic assessment for how well you know the material.

General Education Course Objectives

- Improve ability to think critically and logically
- Improve ability to reason quantitatively and to perform basic chemical computations
- Learn how to use the scientific method and theories to understand organic chemistry
- Develop an appreciation for the importance of the role of organic chemistry in everyday life
- Develop an understanding of the historical development of the field of organic chemistry

Learning Outcome Expectations:

After this course, students should be able to:
understand the structure and bonding of organic molecules
understand the nomenclature of aliphatic and aromatic compounds
understand conformational structures of alkanes
recognize and assign stereochemical designations of organic compounds
predict products from reactions of alkenes, alkynes, alkyl halides, dienes, and aromatic compounds based on a mechanistic understanding of these reactions and apply these reactions in multi-step syntheses

Fundamentals: The Basics

Atomic structural theory, Lewis structures, Formal charges, constitutional isomers, basic resonance theory

Atomic, molecular, and hybrid orbitals, covalent bonding, shapes of molecules

Polarity of molecules and bonds

Physical properties and intermolecular forces

Functional groups and families of organic compounds

Acid and base properties, equilibria, and relative acid/base strengths, structural features affecting acidity(e.g., inductive effects, resonance, hybridization, etc.), selection of appropriate conjugate base for H removal

Evaluate nucleophilic strength

Potential energy diagrams of reactions, activation energies of reactions

Introduction to Mechanisms and Synthesis:

Introduction to mechanisms

Curved arrow notation

Basic retrosynthetic analysis

Synthesis of alkanes, alkenes, alkynes, and aromatic compounds

Hammond Postulate

Organic Nomenclature

IUPAC Nomenclature of alkanes, cycloalkanes, bicycloalkanes, alkenes, cycloalkenes, alkynes, alkyl halides, and aromatic compounds

R/S Nomenclature system for chiral molecules

E/Z Nomenclature system for alkenes

Stereochemistry

Chirality

Optical activity, specific rotation, optical purity, enantiomeric excess

Enantiomers, diastereomers, meso compounds

Stereoisomerism of cyclic compounds

Stereochemistry in reactions

Resolution of a racemic mixture

Hydrocarbons (*Alkanes, cycloalkanes, alkenes, alkynes, dienes, and aromatics*)

Structure and physical properties

Ring strain and conformations of cycloalkanes

Conformational analysis of ethane and higher alkanes

Cyclohexane- chair, boat, axial/equatorial positions, "flipping" between conformations

Relative stabilities of alkenes and alkynes

Reactions and Their Mechanisms

- Nucleophilic substitution reactions (SN2 and SN1)
- Elimination reactions (E2 and E1)
- Homolytic bond dissociation Energies
- Free radical reactions, halogenation of alkanes, radical addition to alkenes
- Halogens and selectivity
- Hydrogenation of alkenes and alkynes
- Reduction of alkyl halides
- Alkylation of terminal alkynes
- Dehydrohalogenation of alkyl halides, Zaitsev and Hofmann rules
- Dehydration of alcohols
- Rearrangements of carbocation intermediates
- Debromination of vicinal dibromides
- Markovnikov's rule and ant-Markovnikov's reactions (Peroxide effect); Regioselectivity
- Addition of hydrogen halides, sulfuric acid, water, and halogens to alkenes and alkynes
- Stereospecific reactions
- Formation of halohydrins
- Oxidations of alkenes and alkynes, syn-hydroxylation, oxidative cleavage, ozonolysis
- Stability of allylic radicals and cations
- Conjugated dienes; their stabilities
- Resonance theory
- Allylic substitution

Spectroscopy

- IR spectroscopy
- Proton NMR
- Carbon NMR

Notification Of Services For Students With Documented Disabilities NIU abides by Section 504 of the Rehabilitation Act of 1973 which mandates reasonable accommodations be provided for qualified students with disabilities. If you have a disability and may require some type of instructional and/or examination accommodation, you will need to register with the Center for Access-Ability Resources (CAAR), the designated office on campus to provide services and administer exams with accommodations for students with disabilities. The CAAR office is located on the 4th floor of the University Health Services building (815-753-1303). Accommodations are not retroactive. Please contact me early in the semester so that I can provide or facilitate in providing accommodations you may need. You must for each exam have a form filled out about 10 business days in advance to be sure to have a CAAR test time appointment.