CHEM 5309: Advanced Organic Chemistry
Fall 2011

Instructor: Frank Foss

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Office Hours: Mondays and Wednesdays, 11:00 – 12:00 or by appointment

Section Information: CHEM 5309-001 (80773)

Time and Place of Class Meetings: Science Hall, 125, MWF 10:00-10:50

Description of Course Content: Chemistry 5309 investigates the relationship between structure and reactivity of organic compounds. We will study advanced bonding theories, physical properties, structural conformations, stereochemistry, reaction kinetics, substituent effects, isotope effects, solvent effects, linear free energy relationships, substitution reactions, orbital symmetry and pericyclic reactions.

Student Learning Outcomes: Predict and evaluate the three-dimensional structure of organic molecules, Identify the general reactivity of compounds, Construct Molecular Orbitals from the combination of atomic orbitals for simple organic species, Employ Hückel MO theory to describe electronic structure of linear and cyclic polyenes, Elucidate reaction mechanisms from empirical kinetic data, Understand conformational and electronic effects on Stereochemical reactions, and Predict the outcome of pericyclic reactions.

Requirements: Preparation (reading ahead) and participation in class discussions and work are expected.

Required Textbook:
Advanced Organic Chemistry: Part A, Fifth Edition by Francis A. Carey and Richard J. Sundberg.

Assessment:	Problem Sets[1]	20%
	Three Exams[2]	20% (each)
	One Final Examination[3]	20%
		100%

[1]Study sessions will be given before each exam to review relative problem sets and student questions.
[2]There will be no make up exams. If an exam is missed, the following policy will be employed.
[3]If you score better on your final than any midterm exam, your final grade will replace your lowest midterm exam.

Important Dates:

August 25th	First day of classes
September 5th	Labor Day Holiday
September 12th	Census Date
September 26th	**EXAM 1**
October 24th	**EXAM 2**
November 5th	Last day to drop
November 21th	**EXAM 3**
November 24th-27th	Thanksgiving Holiday
December 10th	Last Day of Classes
December 12th	**FINAL EXAMINATION – 8:00 - 10:30AM 125 SH**

TOPICS TO BE COVERED:

1. Chemical Bonding and Structure – Chapter 1:
    a. Valence Bond Theory
        i. hybridization
        ii. electronegativity
        ii. polarizability/hard soft theory
        iv. resonance/hyperconjugation
    b. Molecular Orbital Theory
        i. LCAO
        ii. Qualitative MO Theory
        Iii. Hückel M.O. Theory

2. Aromatic Systems – Chapter 8:
    a. Defining Aromatic/AntiaromaticSystems
    b. Annulenes with 4n or 4n+2 electrons
    c. Charged Ring Systems
    d. Homoaromaticity
    e. Fused Rings
    f. Heteroaromatic Systems

3. Stereochemical Principles – Chapter 2:
    a. Enantiomers
    b. Diastereomers
    c. Stereochemistry of Dynamic Processes
    d. Prochiral Relationships

4. Conformational and Stereoelectronic Processes – Chapter 2:
    a. Steric Strain
    b. Acyclics
    c. Cyclohexane Derivatives
    d. Other Carbocyclic Rings
    e. Heterocyclics
    f. Reactivity
    g. Stereoelectronics

5. Reaction Mechanisms – Chapter 3:
    a. Thermodynamics
    b. Kinetics
    c. Kinetic vs. Thermodynamic
    d. Reactive Intermediates
    e. Isotope Effects
    f. Linear Free-Energy Relationships
    g. Acid/Base Catalysis
    h. Lewis Acid Catalysis
    i. Solvent Effects

6. Nucleophilic Substitution – Chapter 4
    a. Unimolecular Mechanism
    b. Bimolecular Mechanism
    c. Borderline Mechanism
    d. Carbocations
    e. Nucleophilicity/Solvent Effects
    f. Strain and Steric Effects
    g. Leaving Group Effects
    h. Substituent Effects
    i. Stereochemistry
    j. Neighboring Group Participation
    k. Rearrangements
    l. Nonclassical Carbocation

7. Carbanions and Other Nucleophilic Carbon Species – Chapter 6
    a. Acidity of Hydrocarbons
    b. Carbanions as Nucleophiles

8. Pericyclic Reactions – Chapter 10:
    a. Electrocyclic Reactions
    b. Sigmatropic Rearrangements
    c. Cycloaddition Reactions

Should time permit, we will discuss additional chapters. You should review the remaining mechanistic chapters of this text (Chapters 5,7, & 9) if you plan on taking Organic Chemistry 2, CHEM 5310

Attendance Policy: Attendance is not compulsory; however, your textbook does not give varying examples or teach you how to solve problems.

Academic Integrity: This class will have a zero tolerance policy for cheating and academic dishonesty. As future independent scientists, you must understand the potential career ending repercussions of stretching the truth, or fabricating results. Cheating or plagiarism will result in a failing grade for this class.

It is the philosophy of The University of Texas at Arlington that academic dishonesty is a completely unacceptable mode of conduct and will not be tolerated in any form. All persons involved in academic dishonesty will be disciplined in accordance with University regulations and procedures. Discipline may include suspension or expulsion from the University. According to the UT System Regents' Rule 50101, §2.2, "Scholastic dishonesty includes but is not limited to cheating, plagiarism, collusion, the submission for credit of any work or materials that are attributable in whole or in part to another person, taking an examination for another person, any act designed to give unfair advantage to a student or the attempt to commit such acts."

Americans with Disabilities Act: The University of Texas at Arlington is on record as being committed to both the spirit and letter of all federal equal opportunity legislation, including the *Americans with Disabilities Act (ADA)*. All instructors at UT Arlington are required by law to provide "reasonable accommodations" to students with disabilities, so as not to discriminate on the basis of that disability. Any student requiring an accommodation for this course must provide the instructor with official documentation in the form of a letter certified by the staff in the Office for Students with Disabilities, University Hall 102. Only those students who have officially documented a need for an accommodation will have their request honored. Information regarding diagnostic criteria and policies for obtaining disability-based academic accommodations can be found at www.uta.edu/disability or by calling the Office for Students with Disabilities at (817) 272-3364.

Librarian to Contact: Antoinette Nelson email: nelsona@uta.edu

Texts on Reserve for CHEM 5309:

Modern Physical Organic Chemistry (Anslyn and Dougherty – if the library purchases a new copy. If not, you may borrow this text from me for up to one day.)
Frontier Orbitals and Organic Chemical Reactions (Fleming)

Suggested Reading for The Graduate Organic Chemist (not necessary for this course):

Reactions/Mechanisms/Structural Theory
Modern Physical Organic Chemistry by Anslyn and Dougherty
Advanced Organic Chemistry: Part B, Fifth Edition by Francis A. Carey and Richard J. Sundberg
Frontier Orbitals and Organic Chemical Reactions by Ian Fleming
Pericyclic Reactions by Fleming
Strategic Applications of Named Reactions in Organic Synthesis by Kürti and Czakó
March's Advanced Organic Chemistry: Reactions, Mechanisms, and Structure by Smith
Journals to Read: OL, JOC, EJOC, OBC, TL, OPR&D, ACIE, JACS, ChemComm, Chemistry . . . whatever gets you excited.

Synthetic Strategy
Classics in Total Synthesis by Nicolaou and Sorensen
Organic Synthesis The Disconnection Approach Warren and Wyatt
Workbook for Organic Synthesis Strategy and Control by Wyatt and Warren
Journals to Read: See above

Stereochemistry and Stereoselectivity
Basic Organic Stereochemistry by Eliel, Wilen, Doyle
Stereoelectronic Effects by Kirby
Principles of Asymmetric Synthesis by Gawley and Aubé
Stereoselectivity in Organic Synthesis by Proctor

Radical/Photochemical Reactions
Modern Molecular Photochemistry by Turro
Radical Reactions in Organic Synthesis by Zard