

CHEM 2322: Organic Chemistry II
Fall 2011

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Office Hours: Tuesday/Thursday 9:00-10:00 AM and by appointment

Section Information: CHEM 2322-001 meets MWF 11:00-11:50 AM in CRB 114
CHEM 2322-002 meets MWF 9:00-9:50 AM in CRB 114

Description of Course Content: A comprehensive survey of the chemistry of carbon compounds: their structure, properties, bonding, stereochemistry, reactions, and reaction mechanisms. An introduction to mass spectrometry, infrared and nuclear magnetic spectroscopy and its application in structure determination. A description of carbonyl chemistry and its relevance to biomolecules, amino acids, carbohydrates, and lipids. A description of the chemistry of dienes, benzene and aromatic substitution reactions, and the chemistry of amines.

Required Textbooks and Other Course Materials:

Organic Chemistry, Seventh Edition, John McMurry
Study Guide and Solutions Manual for McMurry's Organic Chemistry (recommended)
Molecular Model Set (recommended)

Exam Dates: (Please note that Exam Dates are tentative. Any changes to Exam Dates will be announced in class.)

Exam 1 (Ch. 12-14)	Wednesday, September 21
Exam 2 (Ch. 15-16)	Wednesday, October 12
Exam 3 (Ch. 19-21)	Wednesday, November 2
Exam 4 (Ch. 22-24)	Wednesday, November 30
Final Exam (Ch. 12-26 Comprehensive)	Wednesday, December 14, 5:30-8:00 PM

Since the Final Exam is a comprehensive departmental exam, it will be given at a special time, Wednesday, December 14, from 5:30-8:00 PM. Room locations for the departmental final exam will be announced in class.

Other Important Dates:

September 5	Labor Day Holiday; Classes do not meet.
September 12	Census Date
November 4	Last Day to Drop a Class
November 24-25	Thanksgiving Holiday; Classes do not meet.
December 9	Last day of classes

Drop Policy: Students may drop or swap (adding and dropping a class concurrently) classes through self-service in MyMav from the beginning of the registration period through the late registration period. **After the late registration period, students must see their academic advisor to drop a class or withdraw.** Undeclared students must see an advisor in the University Advising Center. Drops can continue through a point two-thirds of the way through the term or session. It is the student's responsibility to officially withdraw if they do not plan to attend after registering. **Students will not be automatically dropped for non-attendance.** Repayment of certain types of financial aid administered through the University may be required as the result of dropping classes or withdrawing. For more information, contact the Office of Financial Aid and Scholarships (<http://wweb.uta.edu/ses/fao>).

Paperwork: When dropping the course, you are responsible for seeing that all of the proper paperwork is completed and submitted to your academic advisor. If this paperwork is not completed, you will receive a letter grade corresponding to your earned grade, including zeros for all missed work.

Grading:	Mid-term exam average	80%	
	Comprehensive Final Exam	20%	Wednesday, December 14, 5:30-8:00 PM

Four mid-term exams plus a Comprehensive Final Exam will be given. These exams will cover the reading, lecture material, and assigned problems. *Due to the nature of Organic Chemistry, each exam is comprehensive.*

Make-up Policy: *No make-up exams will be given, and any missed exams will result in a grade of zero. However, the final exam score will replace the lowest mid-term exam score if it is to the student's benefit.*

Grade assignments:	<u>Average</u>	<u>Letter Grade</u>
	≥ 88.00%	A
	≥ 75.00%	B
	≥ 63.00%	C
	≥ 50.00%	D
	< 50.00%	F

Homework: *Working through problems is the best way to learn the material in this course.* Each student is expected to work homework problems found in the textbook. Additional problems may be assigned on Blackboard. Although these problems will not be collected or graded, you are responsible for working them out. Be advised that just doing the simple drill problems is not adequate preparation; you should do the longer problem-solving type of questions as this really addresses whether you adequately understand the material.

Examination Needs: You must bring the following to each examination:

UTA Student ID Card

No. 2 pencils with eraser

Scientific Calculator (only non-graphing calculators are allowed; you may not use a graphing calculator)

Students are not allowed to have access to cell phones or digital pagers during any exam.

Cell Phones: Please silence all cell phones prior to class. *Texting during class is inappropriate and will not be tolerated.*

Attendance:

Faithful attendance is mandatory (excessive absences will lower the final grade), but attendance alone is not sufficient. Active participation is essential for success. Participation includes advance preparation of reading assignments, coming to class prepared with molecular models, and involvement with classroom discussions. Questions are always welcomed; I will be happy to re-explain concepts. Successful participation in the classroom will frequently stimulate continuing discussion outside the classroom, both with fellow students and with the instructor. These ongoing interactions will prove valuable, and they are to be encouraged. An important point is that class time is limited, and I will not have time to cover all of the material given as reading assignments. You are responsible for all of the material covered in the lectures, the assigned text, and the problems.

Electronic Communication: UT Arlington has adopted MavMail as its official means to communicate with students about important deadlines and events, as well as to transact university-related business regarding financial aid, tuition, grades, graduation, etc. All students are assigned a MavMail account and are responsible for checking the inbox regularly. There is no additional charge to students for using this account, which remains active even after graduation. Information about activating and using MavMail is available at <http://www.uta.edu/oit/cs/email/mavmail.php>.

Topics to be Covered:

A. *Structural Determination of Organic Compounds* (Ch. 12)

- i. Introduction-degrees of unsaturation
- ii. Mass Spectrometry-12.1-12.3
- iii. Infrared Spectroscopy-12.5-12.8
 - a. Introduction to Spectroscopy
 - b. IR of Organic Compounds

B. *Nuclear Magnetic Resonance Spectroscopy* (Ch. 13)

- i. Introduction to NMR-13.1
- ii. Nature of Absorptions-13.2
- iii. Chemical Shifts-13.3
- iv. ¹³C NMR Number of Absorptions-13.4-13.5
- v. DEPT-13.6
- vi. ¹H NMR-13.8-13.9
- vii. Integration-13.10
- viii. Spin-Spin Coupling-13.11-13.12

C. *Dienes* (Ch. 14)

- i. Conjugated Systems
- ii. Stability of Dienes-14.1
- iii. Molecular Orbital Description of 1,3-Butadiene-14.1

- iv. Bond Lengths-14.1
- v. Electrophilic Addition-14.2
- vi. Kinetic vs. Thermodynamic Control-14.3
- vii. The Diels-Alder Reaction-14.4-15.5
- viii. UV Spectroscopy 14.7-14.8

EXAM 1 - Chapters 12-14 (Wednesday, September 21)

D. *Aromaticity & Benzene* (Ch. 15)

- i. Nomenclature-15.1
- ii. Structure of Benzene-15.2
- iii. Stability of Benzene-15.2
- iv. Hückel's Rule-15.3/15.6
- v. Molecular Orbital Picture of Benzene-15.3
- vi. Other Aromatics-15.4-9
- vii. NMR of aromatics-15.8

E. *Electrophilic Aromatic Substitution* (Ch. 16)

- i. Halogenation-16.1, 16.2
- ii. Nitration-16.2
- iii. Sulfonation-16.2
- iv. Friedel-Crafts Alkylation-16.3
- v. Friedel-Crafts Acylation-16.3
- vi. Substituent Effects-16.4
- vii. Orientation of Reactions on Substituted Aromatic Rings-16.5-16.6
- viii. Nucleophilic Aromatic substitution-16.7-16.8
- ix. Oxidation of Aromatic Compounds-16.9
- x. Reduction of Aromatic Compounds-16.10
- xi. Side-Chain Bromination-16.10
- xii. Reduction of Aromatic Rings-16.11
- xiii. Synthesis of Substituted Benzenes-16.12

EXAM 2 - Chapters 15-16 (Wednesday, October 12)

F. *Aldehydes & Ketones* (Overview pp 686-694 Read & Ch. 19)

- i. Structure & Nomenclature-19.1
- ii. Aldehyde preparation-19.2
 - a. Oxidation of Alcohols with PCC
 - b. Ozonolysis
 - c. DIBAL-H reduction of Esters
- iii. Preparation of Ketones-19.2
 - a. Oxidation of Secondary Alcohols
 - b. Ozonolysis
 - c. Acylation of Benzene
 - d. Hydration of Alkynes
 - e. Reaction of Organometallics with Acyl Chlorides
- iv. Oxidation Reactions-19.3
- v. Nucleophilic Addition Reactions-19.4-19.7, 19.10-19.11
- vi. Addition-Elimination Reactions-19.8-19.9
- vii. Cannizzaro Reaction-19.12
- viii. Conjugate Addition-19.13

G. *Carboxylic Acids & Derivatives* (Ch. 20, 21)

- i. Nomenclature-20.1
- ii. Structure and Properties-20.2
- iii. Acidity (Acids & Phenols)-20.3-20.4
- iv. Preparation-20.5
 - a. Oxidation of Alkylbenzenes
 - b. Oxidation of Primary Alcohols
 - c. Other Methods
- v. Reactions of Carboxylic Acids and Derivatives-20.6-7, 21.1-21.9

EXAM 3 - Chapters 19-21 (Wednesday, November 2)

- H. *Carbonyl Alpha-Substitution Reactions* (Ch. 22)
 - i. Keto-Enol Tautomerism-22.1
 - ii. Alpha-Halogenation-22.2-22.4
 - iii. Enolate Ions-22.5-22.8

- I. *Carbonyl Condensation Reactions* (Ch. 23)
 - i. Aldol Condensation-23.1-23.2
 - ii. Dehydration of Aldol Products-23.3
 - iii. Mixed Aldol Products-23.5
 - iv. Intramolecular Aldol-23.6
 - v. Claisen-Condensation-23.7
 - vi. Mixed-Claisen Reactions-23.8
 - vii. Intramolecular Claisen = Dieckmann cyclization-23.9
 - viii. Michael Reaction-23.11

- J. *Aliphatic & Aromatic Amines* (Ch. 24)
 - i. Nomenclature & Structure-24.1, 24.2
 - ii. Amine Basicity-24.3-24.4
 - iii. Synthesis of Alkyl Amines-24.6
 - a. Gabriel Synthesis
 - b. Reduction of Nitriles and Amides
 - c. Reductive Amination of Aldehydes and Ketones
 - iv. Reactions-24.7
 - v. Aryl Amines
 - a. Reactions-24.8
 - b. Synthesis and Reactions of Diazonium Salts
 - c. Heterocycles – time permitting

EXAM 4 - Chapters 22-24 (Wednesday, November 30)

- K. *Carbohydrates*-Ch 25
 - i. Configuration
 - ii. D, L-Sugars
 - iii. Configurations of Aldoses (Only those covered in class)
 - iv. Cyclic Structures
 - v. Anomers & Mutorotation
 - vi. Reactions (Only those covered in class)
 - vii. Structure of Glucose (Fischer's Proof)
 - viii. Disaccharides & Polysaccharides

- L. *Amino Acids & Proteins*-Ch 26
 - i. Structure
 - ii. Isoelectric Point
 - iii. Peptides
 - iv. Peptide Analysis
 - v. Peptide Synthesis

FINAL EXAM - Chapters 12-26 Comprehensive (Wednesday, December 14, 5:30-8:00 PM)

Student Learning Outcomes:

- 1) Correctly name organic compounds using IUPAC nomenclature, or, given an IUPAC name, depict the molecular structure.
- 2) Accurately represent the structure of any organic compound, both on paper and also in three dimensional space using models or drawings.
- 3) Account for the physical properties and chemical reactivity of any organic compound on the basis of molecular structure.
- 4) Predict the outcome of an organic reaction, given the identities of the reactants.
- 5) Recognize important substances and chemical processes which have practical applications in household, laboratory, industry, and medicine.

- 6) Use the theoretical concepts of reactive intermediates, molecular orbitals, hybridization, resonance, tautomerism, and polarity in discussing the structure and reactivity of organic compounds.

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.

Academic Integrity: At UT Arlington, academic dishonesty is completely unacceptable and will not be tolerated in any form, including (but 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" (UT System Regents' Rule 50101, §2.2). Suspected violations of academic integrity standards will be referred to the Office of Student Conduct. Violators will be disciplined in accordance with University policy, which may result in the student's suspension or expulsion from the University.

Chemistry Assistance:

Science Education and Career Center: The Science Education and Career Center, located in Room 105 of the Life Science Building, provides a variety of materials for assisting Chemistry students, including old Chemistry 2322 exams.

Chemistry Clinic: The Chemistry Clinic, located in Room 318 Science Hall, will be staffed with tutors available to answer your questions related to lecture and homework. Hours of the Chemistry Clinic will be announced in class. This service is free for students enrolled in Chemistry 2322.

SOAR Cost Share Tutoring: SOAR (Students Obtaining Academic Readiness) is located in 132 Hammond Hall and offers free academic support for qualifying students and low-cost services for all students, including Cost Share Tutoring.

Strategies for Succeeding in Chemistry 2322:

1. Attend *every* lecture.
2. Prior to class, read the chapter which will be covered in lecture.
3. Review your lecture notes after each class. Correct obvious errors and note topics which require further study or clarification.
4. Work all of the suggested homework problems. Do not look in the solutions manual until you have given your best effort to solve the problem on your own.
5. Use practice tests available from the Science Learning Center.
6. Spend the necessary amount of time studying chemistry. The rule of thumb for succeeding in Chemistry is three hours of study for every hour of lecture. This means that at a minimum you should plan to study Chemistry nine hours each week.
7. Don't procrastinate. These concepts take time to sink in, and you may have to practice these exercises over a period of many days in order master the necessary skills.
8. Form a study group. This is your first avenue for getting help. Be able to communicate with each other on short notice, not just before class.

Student Feedback Survey: At the end of each term, students enrolled in classes categorized as lecture, seminar, or laboratory will be asked to complete an online Student Feedback Survey (SFS) about the course and how it was taught. Instructions on how to access the SFS system will be sent directly to students through MavMail approximately 10 days before the end of the term. UT Arlington's effort to solicit, gather, tabulate, and publish student feedback data is required by state law; student participation in the SFS program is voluntary.

Final Review Week: A period of five class days prior to the first day of final examinations in the long sessions shall be designated as Final Review Week. The purpose of this week is to allow students sufficient time to prepare for final examinations. During this week, there shall be no scheduled activities such as required field trips or performances; and no instructor shall assign any themes, research problems or exercises of similar scope that have a completion date during or following this week *unless specified in the class syllabus*. During Final Review Week, an instructor shall not give any examinations constituting 10% or more of the final grade, except makeup tests and laboratory examinations. In addition, no instructor shall give any portion of the final examination during Final Review Week. During this week, classes are held as scheduled. In addition, instructors are not required to limit content to topics that have been previously covered; they may introduce new concepts as appropriate.