

Course Syllabus¹

CHEM 2323 – ORGANIC CHEMISTRY I, SPRING 2009

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PRE-REQUISITES: General Chemistry I and II or equivalent

COURSE DESCRIPTION

This course provides an overview of fundamental organic chemistry. Students who successfully complete this course acquire an integrated understanding of molecular architecture, molecular transformations, reaction energetics and mechanisms, synthetic strategy, and structure determination. An important goal is to foster an appreciation of the subject by encouraging students to explore their own interest in it.

LEARNING OBJECTIVES

- Understand the rules of chemical bonding molecular structure, potential energy-stability relationships, Lewis structures, resonance theory, conformational analysis, and stereochemistry.
- Identify centers of reactivity in organic structures, including the names, structures, and basic chemical properties of the most important functional groups.
- Understand the principles of ionic and free-radical reaction mechanisms and their energetics as represented in potential energy diagrams.
- Understand the use of the curved arrows for electron movement in organic reaction mechanisms.
- Understand the basic concepts of the Lewis and Bronsted-Lowry theories of acids and bases.
- Understand the structural features and chemistry of the most important functional groups.
- Understand the basic concepts of organic transformations and synthesis, including the design of simple and efficient routes for the preparation of simple organic molecules.

REQUIRED TEXTBOOK – L. G. Wade, Jr. *Organic Chemistry*. 6th. ed.

RECOMMENDED MATERIALS

1. Solutions Manual

The solutions manual to the Wade textbook contains the answers to all the problems in the textbook. Therefore it is strongly recommended. You might find it cost-effective to form a group of students and buy one copy for the group, since you won't need it as regularly as the textbook.

2. Reference textbooks (prices quoted are current as of Jan. 2009).

- *Organic Chemistry I as a Second Language* by David R. Klein. A more in-depth discussion of basic principles such as resonance structures, use of curved arrows, orbital hybridizations, etc. About \$40 at Amazon.
- *Organic Chemistry II as a Second Language* by David R. Klein. Coverage of typical concepts presented in organic chem II courses. About \$30 at Amazon.
- *The Nuts and Bolts of Organic Chemistry* by Joel Karty. About \$30 at Amazon.

¹ The descriptions and timelines presented in this syllabus are subject to change at the discretion of the Professor.

3. **Molecular model sets.** If you wish to enhance your ability to visualize 3-dimensional features and movements in organic structures, you may benefit from using a molecular model set. Some reasonably priced kits, yet adequate for student use, can be obtained from the following vendors.

- **Darling Models / Molecular Visions.** <http://www.darlingmodels.com>
- **Indigo.** Has *Molymod* sets for organic chemistry. <http://indigo.com/models/molymod-molecular-model-sets.html>
- **Amazon.** Search for “molymod.” A wide variety of molecular model sets will be displayed. The recommended set is the *Prentice-Hall molecular model set for organic chemistry* (about \$40 on last check).
<http://www.amazon.com/exec/obidos/subst/home/home.html/002-9078151-4305639>

Be careful what you buy. Not all models are adequate. If you go too cheap you will end up with junk. Models priced between \$20 and \$40 are usually adequate for use in this course.

LECTURE AND TESTS SCHEDULE

| | |
|-------------------------------|--|
| Jan. 12 – 16 | Chapter 1 / lecture notes # 1 – 3 |
| Jan. 21 – 28 | Chapter 2 / lecture notes # 4 – 7 |
| Jan. 30 – Feb. 4 | Chapter 3 / lecture notes # 8 |
| Feb. 6 | Begin chapter 5 / lecture notes # 9 (not for test #1) |
| Feb. 9 | TEST # 1 on ch. 1 – 3 and relevant lecture notes |
| Feb. 11 – 16 | Continue chapter 5 / lecture notes # 9 |
| Feb. 18 – 25 | Chapter 4 / lecture notes # 10 |
| Feb. 27 – Mar. 4 | Bronsted acid-base chemistry: Chapter 1 / lecture notes 11 & 11a |
| Mar. 6 | Begin chapter 6 / 7, lecture notes # 12 – 15 (not for test # 2) |
| Mar. 9 | TEST # 2 on ch. 4, 5, Bronsted acid-base chemistry, and lecture notes |
| Mar. 11 – Apr. 25 | Continue chapters 6 and 7, lecture notes # 12 – 15 |
| Mar. 27 – Apr. 3 | Chapter 8 and lecture notes # 16, 17, 17a |
| Apr. 6 | TEST # 3 on ch. 6, 7, 8 and relevant lecture notes |
| Apr. 8 – 15 | Chapter 9 and lecture notes # 18 & 20 |
| Apr. 17 – 24 | Chapter 10 and lecture notes # 21 – 23 |
| Apr. 27 – May 4 | Chapter 11: Select reactions and synthesis |
| May 11 8.00 – 10:00 am | TEST # 4 on ch. 8 – 10 and relevant lecture notes |

STUDY TIPS

1. **Prior to lecture:** Do a quick, superficial reading of the material. The aim here is to get an idea of the big picture: a gross sketch of the chapter. Do not get bogged down in details. Just keep reading and try to grasp as much as you can on the fly, without stopping for thorough comprehension. The lecture will highlight what’s important and prepare you for a second reading.

2. During lecture

- Do not try to write down everything the instructor says. Detailed lecture notes are already available online. You should bring these with you and just focus on listening to the explanations.
- You should write points that receive special emphasis. The instructor will be very clear about this. You should also write anything that involves a **process** that is difficult to cover point by point in the notes. Examples are: how to draw resonance structures, molecular conformations, cyclohexane chairs, and electron movement in reaction mechanisms.
- Everything else should be approached as if you were preparing a PowerPoint presentation: write brief snippets organized by bullets that serve as pointers to the material covered, but which do not provide much detail. That's already covered in the notes and in the book.

3. After lecture

- Go back for a more in-depth reading, focusing on the points stressed in lecture. This time try to understand enough to **do the problems given at the end of each section**.
- After you feel comfortable doing the problems at the end of each section, **try the problems at the end of the chapter**. Focus on those that are most directly relevant to what was discussed in class.
- You should spend a reasonable effort **trying to do as many problems as possible on your own**, but you should also be realistic as to how much time you can devote to a particular class. Do not be shy to ask for help if you find that you're spending too much time on a particular problem or course. This will only detract from the time you can spend on other things and result in ineffective time management.

REMEMBER: EFFECTIVENESS, NOT PERFECTION, IS WHAT MAKES A GOOD STUDENT AND A BETTER PROFESSIONAL

Effectiveness, by its own nature, involves compromises. Perfection would be nice, but it is unattainable. Obsessing about perfection will only rob you of your sanity, your social life, your smile, your health, and ultimately your most cherished goals. In one word: it is self-defeating. If you believe that perfection is the only way to achieve your goals (for example, getting into medical school), you should either revise your methods, or change your goals to others that might be a more natural fit to you. This will most likely and almost automatically make you a more effective (and happier) person.

TOPIC DESCRIPTIONS

Chapter 1: Introduction & review of general chemistry. Atomic structure & bonding, Lewis formulas, resonance, conjugation, electron mobility, polarity, and electron density distributions.

Chapter 2: Fundamentals of molecular structure: Basic molecular orbital theory, hybridization, sigma and pi bonding in hydrocarbons, structural and geometric isomerism, introduction to functional groups.

Chapter 3: Alkanes and conformational analysis. Basic rules of organic nomenclature, conformational analysis of alkanes & cycloalkanes, alkanes as basic skeletons in the makeup of complex molecules.

Chapter 5: Stereochemistry. Symmetry and chirality, stereoisomerism, *R/S* nomenclature, chiral environments and the differentiation of stereoisomers, Fischer formulas, meso forms.

Chapter 4: Reaction mechanisms & alkane chemistry. Introduction to molecular transformations, basic bond formation and bond breaking processes, reaction intermediates, free radical mechanisms, energetics, free radical halogenation and its importance in the functionalization of alkanes.

Ionic (polar) mechanisms: Bronsted acid-base chemistry. Sections 1-13, 1-14, and additional notes. Structure and acidity, trends in acidity and basicity, introduction to Lewis acid-base theory.

Chapter 6: Ionic mechanisms and nucleophilic substitutions. Alkyl halides as synthetic precursors, nucleophilic substitutions of tetrahedral carbon, Sn1 and Sn2 reactions.

Chapters 6 and 7: Elimination reactions and alkene synthesis. E1 and E2 reactions, competing processes in Lewis acid-base chemistry, alkene synthesis and properties.

Chapters 8 and 9: Chemistry of Carbon-Carbon pi-bonds (Alkenes and Alkynes). Electrophilic and other addition reactions, oxidative cleavage, alkenes in organic synthesis, functional group equivalents, alkynes as acids, alkynide ions as nucleophiles and bases, use of carbon nucleophiles in organic synthesis.

Chapter 10: Alcohols: Structure and Synthesis. Structure and physical properties of alcohols, use of Grignard reagents as carbon nucleophiles in alcohol synthesis, reductions of carbonyl compounds, thiols.

Chapter 11: Alcohols: Reactions. Alcohols as acids, bases, and nucleophiles. Oxidation and esterification reactions. Alcohols in organic synthesis.

GRADING POLICY

The bulk of the final grade is based on 4 exams. Students can **drop one of the first three exams, but not exam 4.** Attendance and practice quizzes basically serve to pump up the test grade in borderline cases.

- 3 EXAMS 80%
- PRACTICE QUIZZES 10%
- ATTENDANCE 10%

LETTER GRADE ASSIGNMENT TABLE (based on final percent grade after round-off)

| | | | |
|----------------------|---------------------|---------------------|---------------------|
| 95 - 100 = A+ | 80 - 84 = B+ | 65 - 69 = C+ | 50 - 54 = D+ |
| 90 - 94 = A | 75 - 79 = B | 60 - 64 = C | 45 - 49 = D |
| 85 - 89 = A- | 70 - 74 = B- | 55 - 59 = C- | 40 - 44 = D- |

THERE IS NO TEST RESCHEDULING, EXTRA CREDIT, OR EXCEPTIONS MADE FOR ANYONE.

Tests are based on **lecture notes, textbook readings, practice quizzes, and exercises.** The format of all tests and quizzes is multiple choice and true/false.

Practice quizzes for each chapter will be posted online in WebCT, according to a schedule and guidelines to be announced during the semester.

Roll call will start on the second week of class. **Your attendance grade will be strictly based on records and not on verbal accounts.**

A WORD ABOUT ATTENDANCE: Many of you are taking this class as a prerequisite for pursuing a career in the health professions. Please understand the following: **IF YOU DON'T HAVE THE DISCIPLINE TO ATTEND CLASS REGULARLY AND BE ON TIME, YOU PROBABLY DON'T HAVE THE DISCIPLINE TO BE IN THE HEALTH PROFESSIONS.** The instructor cannot be held accountable for students who fail to master the material for lack of attendance, and who most likely will not perform in organic chemistry II.

This cannot be emphasized enough: You can pass this course without attending class, but if you follow this approach you will not be prepared to perform in organic chemistry II. At that point you will face the unpleasant and costly choice of having to take either course again, or change your major.

ADDITIONAL INFORMATION

LECTURE ROOM ETIQUETTE. You are taking this lecture by your own decision in order to further goals that are important TO YOU. The instructor and fellow students expect mature behavior from you at all times. Any behavior that is disruptive to lecture, inconsiderate, or offensive reflects poorly on the offender and is subject to disciplinary action. Examples of disruptive behavior are talking during a lecture, giggling, loud speech, and use of cellular telephones.

Please silence your telephone before entering the lecture room. If you must take a call during lecture time, please leave the lecture room. Likewise, **communication of any kind during tests is prohibited.** If you have an emergency during a test, you must surrender your test and resolve the issue with your instructor at a later time. However, this does not carry any obligation on the part of the instructor to reissue the test or change the grading policy.

LAST BUT NOT LEAST, ALWAYS REMEMBER (in case you're tempted to go the easy route):

CHEATING IS NOT COOL AND IT IS NOT HIP! IT IS THE FEEBLEST APPROACH TO THE CHALLENGES THAT LIFE WILL POSE TO YOU IN COLLEGE AND IN YOUR PROFESSIONAL LIFE

Student Conduct & Discipline

The University of Texas System and The University of Texas at Dallas have rules and regulations for the orderly and efficient conduct of their business. It is the responsibility of each student and each student organization to be knowledgeable about the rules and regulations which govern student conduct and activities. General information on student conduct and discipline is contained in the UTD publication, *A to Z Guide*, which is provided to all registered students each academic year.

The University of Texas at Dallas administers student discipline within the procedures of recognized and established due process. Procedures are defined and described in the *Rules and Regulations, Board of Regents, The University of Texas System, Part 1, Chapter VI, Section 3*, and in Title V, Rules on Student Services and Activities of the university's *Handbook of Operating Procedures*. Copies of these rules and regulations are available to students in the Office of the Dean of Students, where staff members are available to assist students in interpreting the rules and regulations (SU 1.602, 972/883-6391).

A student at the university neither loses the rights nor escapes the responsibilities of citizenship. He or she is expected to obey federal, state, and local laws as well as the Regents' Rules, university regulations, and administrative rules. Students are subject to discipline for violating the standards of conduct whether such conduct takes place on or off campus, or whether civil or criminal penalties are also imposed for such conduct.

Academic Integrity

The faculty expects from its students a high level of responsibility and academic honesty. Because the value of an academic degree depends upon the absolute integrity of the work done by the student for that degree, it is imperative that a student demonstrate a high standard of individual honor in his or her scholastic work.

Scholastic dishonesty includes, but is not limited to, statements, acts or omissions related to applications for enrollment or the award of a degree, and/or the submission as one's own work or material that is not one's own. As a general rule, scholastic dishonesty involves one of the following acts: cheating, plagiarism, collusion and/or falsifying academic records. Students suspected of academic dishonesty are subject to disciplinary proceedings.

Plagiarism, especially from the web, from portions of papers for other lectures, and from any other source is unacceptable and will be dealt with under the university's policy on plagiarism (see general catalog for details). This course will use the resources of turnitin.com, which searches the web for possible plagiarism and is over 90% effective.

Email Use

The University of Texas at Dallas recognizes the value and efficiency of communication between faculty/staff and students through electronic mail. At the same time, email raises some issues concerning security and the identity of each individual in an email exchange. The university encourages all official student email correspondence be sent only to a student's U.T. Dallas email address and that faculty and staff consider email from students official only if it originates from a UTD student account. This allows the university to maintain a high degree of confidence in the identity of all individual corresponding and the security of the transmitted information. UTD furnishes each student with a free email account that is to be used in all communication with university personnel. The Department of Information Resources at U.T. Dallas provides a method for students to have their U.T. Dallas mail forwarded to other accounts.

Withdrawal from Lecture

The administration of this institution has set deadlines for withdrawal of any college-level courses. These dates and times are published in that semester's course catalog. Administration procedures must be followed. It is the student's responsibility to handle withdrawal requirements from any lecture. In other words, I cannot drop or withdraw any student. You must do the proper paperwork to ensure that you will not receive a final grade of "F" in a course if you choose not to attend the lecture once you are enrolled.

Student Grievance Procedures

Procedures for student grievances are found in Title V, Rules on Student Services and Activities, of the university's *Handbook of Operating Procedures*.

In attempting to resolve any student grievance regarding grades, evaluations, or other fulfillments of academic responsibility, it is the obligation of the student first to make a serious effort to resolve the matter with the instructor, supervisor, administrator, or committee with whom the grievance originates (hereafter called "the respondent"). Individual faculty members retain primary responsibility for assigning grades and evaluations. If the matter cannot be resolved at that level, the grievance must be submitted in writing to the respondent with a copy of the respondent's School Dean. If the matter is not resolved by the written response provided by the respondent, the student may submit a written appeal to the School Dean. If the grievance is not resolved by the School Dean's decision, the student may make a written appeal to the Dean of Graduate or Undergraduate Education, and the dean will appoint and convene an Academic Appeals Panel. The decision of the Academic Appeals Panel is final. The results of the academic appeals process will be distributed to all involved parties.

Copies of these rules and regulations are available to students in the Office of the Dean of Students, where staff members are available to assist students in interpreting the rules and regulations.

Incomplete Grade Policy

As per university policy, incomplete grades will be granted only for work unavoidably missed at the semester's end and only if 70% of the course work has been completed. An incomplete grade must be resolved within eight (8) weeks from the first day of the subsequent long semester. If the required work to complete the course and to remove the incomplete grade is not submitted by the specified deadline, the incomplete grade is changed automatically to a grade of F.

Disability Services

The goal of Disability Services is to provide students with disabilities educational opportunities equal to those of their non-disabled peers. Disability Services is located in room 1.610 in the Student Union. Office hours are Monday and Thursday, 8:30 a.m. to 6:30 p.m.; Tuesday and Wednesday, 8:30 a.m. to 7:30 p.m.; and Friday, 8:30 a.m. to 5:30 p.m.

The contact information for the Office of Disability Services is:
The University of Texas at Dallas, SU 22
PO Box 830688
Richardson, Texas 75083-0688
(972) 883-2098 (voice or TTY)

Essentially, the law requires that colleges and universities make those reasonable adjustments necessary to eliminate discrimination on the basis of disability. For example, it may be necessary to remove lecture room prohibitions against tape recorders or animals (in the case of dog guides) for students who are blind. Occasionally an assignment requirement may be substituted (for example, a research paper versus an oral presentation for a student who is hearing impaired). Lectures enrolled students with mobility impairments may have to be rescheduled in accessible facilities. The college or university may need to provide special services such as registration, note-taking, or mobility assistance.

It is the student's responsibility to notify his or her professors of the need for such an accommodation. Disability Services provides students with letters to present to faculty members to verify that the student has a disability and needs accommodations. Individuals requiring special accommodation should contact the professor after lecture or during office hours.

Religious Holy Days

The University of Texas at Dallas will excuse a student from lecture or other required activities for the travel to and observance of a religious holy day for a religion whose places of worship are exempt from property tax under Section 11.20, Tax Code, Texas Code Annotated.

The student is encouraged to notify the instructor or activity sponsor as soon as possible regarding the absence, preferably in advance of the assignment. The student, so excused, will be allowed to take the exam or complete the assignment within a reasonable time after the absence: a period equal to the length of the absence, up to a maximum of one week. A student who notifies the instructor and completes any missed exam or assignment may not be penalized for the absence. A student who fails to complete the exam or assignment within the prescribed period may receive a failing grade for that exam or assignment.

If a student or an instructor disagrees about the nature of the absence [i.e., for the purpose of observing a religious holy day] or if there is similar disagreement about whether the student has been given a reasonable time to complete any missed assignments or examinations, either the student or the instructor may request a ruling from the chief executive officer of the institution, or his or her designee. The chief executive officer or designee must take into account the legislative intent of TEC 51.911(b), and the student and instructor will abide by the decision of the chief executive officer or designee.

Off-Campus Instruction and Course Activities

Off-campus, out-of-state, and foreign instruction and activities are subject to state law and University policies and procedures regarding travel and risk-related activities. Information regarding these rules and regulations may be found at the website address given below. Additional information is available from the office of the school dean. ([http://www.utdallas.edu/Business Affairs/Travel_Risk_Activities.htm](http://www.utdallas.edu/Business%20Affairs/Travel_Risk_Activities.htm))