CHEM 141 – Organic Chemistry I
Spring 2012
M, W, Th, F (10:30 – 11:20, section 003)

Instructor: Dr. Todd Swanson
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Classroom: Nobel Hall; Rm. 201

Office Hours and communication: M, W, 11:30 - 12:30; other times if I am available, or by appointment. Not in the morning the hour before lecture. I will occasionally use email or Moodle to communicate with the class as a whole. Please check both with some frequency (~daily).

Materials:

Texts: John McMurry, *Organic Chemistry, with Biological Applications*, 2nd Edition;
Sapling Access to Saplinglearning.com.
Lab Text: *Organic Chemistry I: Che-141 Laboratory Experiments Spring 2012*
James W. Zubrick*, The Organic Chem Lab Survival Manual: A Student's Guide to Techniques, 2010.*
Supplies: A model kit: *Molecular Visions* by Darling Models.
Safety goggles; bound laboratory notebook with carbon-copy duplicate pages.

On-line Resources:

Moodle: The course Moodle page will contain information, handouts, powerpoints, etc. for the course. http://moodle.gac.edu/
Sapling homework: http://saplinglearning.com

Course Description: Organic chemistry involves the study of carbon-containing compounds and encompasses the chemistry of living organisms. After studying two semesters of organic chemistry, a typical student can understand most of the chemical interactions in living systems in the world around us. Thus, organic chemistry is a very powerful and empowering subject of study.

Organic chemistry requires developing a set of skills that is completely different from any other that you may have previously encountered. Two-dimensional line drawings of organic structures represent three-dimensional molecules. A short-hand (in chemical jargon, "arrow-pushing") is used to explain sequences of chemical reactions. Learning to use the models and formalisms of organic chemistry is like learning a new language. As you begin to learn the "language of organic chemistry" a whole new perspective from which to view, analyze, and interpret the world becomes available to you.

The concepts of organic structure, bonding, chemical reactivity, reactions as acids and bases, mechanisms and stereochemistry will be introduced. A mechanistic approach to understanding organic reactions will be emphasized. The chemistry of alkanes, alkenes, alkyl halides, and alcohols will be covered. Competing mechanisms involved in substitution and elimination reactions are examined. Infrared (IR), nuclear magnetic resonance (NMR), ultraviolet (UV) spectroscopy and mass spectrometry (MS) will also be introduced.

Objectives: Students should begin to develop an understanding of the relationship between the three-dimensional structures and the physical and chemical (reactivity) properties of organic molecules. Typical questions we will address include:

- What is the three-dimensional shape or structure of this molecule?
- How does the shape/polarity affect the way this molecule interacts with other molecules?
- How can we describe the pathway or mechanism by which a reaction occurs?
- How can we predict the reactivity of molecules?

Tackling these questions requires building up an arsenal of skills, including:

- Predicting and drawing Lewis structures from formulas or names
- Constructing three-dimensional models (physically *and* mentally) of Lewis structures
- Predicting lowest energy isomers or conformations
- Determining favorable equilibria from equilibrium constants (i.e.: using pKa values)
- Interpreting kinetic data with respect to reaction mechanism
- Predicting the reactivity of molecules from their steric (bulky) and electronic (polar) attributes
- Writing reasonable reaction mechanisms using the "arrow pushing" formalism
- Determining organic molecular structure from spectroscopic data

Some of the theories, models or concepts that you have already learned in introductory chemistry and that are applicable to organic chemistry are Lewis structures, valence shell electron pair repulsion (VSEPR) theory, intermolecular forces, valence bond theory, hybridization of orbitals, enthalpies of reaction and combustion, bond enthalpies, and acidity/basicity. These are concepts that you should be familiar with and we will only briefly review these models and theories.

Homework: You will be graded on two different kinds of homework. Weekly homework will be completed using the Sapling Online Learning system. You should register for Sapling before the first day of class, so you can do the introductory assignments to be certain that your browser is set up correctly, and to learn to use the Sapling system. To get credit for the assignments, they must be completed by the set due date.

You will also hand in (non-Sapling) written homework problems each Friday on which there is no scheduled exam. These will be due at the beginning of class. The lowest weekly hand-in homework score will be dropped, and there will be **no make-up homework**. Late homework will be severely penalized. **Homework received later than 3 days or after solutions have been posted, will not be accepted.** As you study your text, you should also work as many in-chapter and end-of-chapter problems as you have time for. Answers to in-chapter problems can be found in Appendix D of the text. I will post the answers to many of the end-of-chapter problems on the course Moodle site.

You are allowed to work with others on homework assignments, however, if you do that, be sure that you (and your collaborators) are all contributing, learning, and understanding the subject matter. You still must turn in your own assignments done in your own hand! Also, realize that copying someone else's homework would do nothing to help you at exam time! *If I determine that all or a portion of your submitted homework is an exact copy of someone else's, those homeworks will each receive a zero.*

Tips for Success:

Teach Yourself Decide, or I should say realize, that if you want to do well in this course (or perhaps even to pass it) you must teach the material to yourself! Organic chemistry is a new and difficult subject for many students, something like learning a foreign language. The instructor's role is to help and to facilitate your learning of the material, but it is necessarily your job to learn it. No one can teach it to you, and you cannot absorb it simply by attending class.

Attendance Attendance in class is essential. Although attendance is not formally recorded in

lecture, I expect your attendance at all classes and hold you responsible for all that is handed out, announced, or discussed there. While the text will be followed fairly closely, additional materials and examples will supplement the lecture. **Some of the material we discuss in lecture will not be in the text**. Regular attendance and active participation in class is helpful to you, to me, and to your classmates. It helps you clarify any difficulties you encounter. It helps me know if I am lecturing too quickly and where I should spend additional time/emphasis. Your attendance and questions will help your classmates in much the same way they help you.

Keep Current The course must cover a lot of ground. To do well you must keep up with the material. Read the assigned chapter sections prior to the start of lecture discussions. Doing so will make the lecture material more understandable and enjoyable. You may also find it helpful to review and perhaps recopy your notes from each lecture before you attend the next one, and to reread/study text sections, and posted PowerPoints. We move fairly quickly through material in this course, and this may help you detect difficulties or correct misconceptions early enough to prevent snowballing. The 15-30 minutes you spend reviewing or recopying your notes (perhaps onto or with printed PowerPoints) may save you hours at exam time. As you review/recopy the notes, think about the material, don't just copy blindly. Ask yourself if the material makes sense.

Solve Many Problems Your homework scores will be determined by your mastery of the Sapling online questions/assignments, as well as points earned on hand-in (non-Sapling) problems. There are also in-chapter and end-of-chapter practice problems in your text that you should work as many as you have time for. Don't fool yourself into thinking you know the answers in your head. Work several end-of-chapter problems before looking at the posted solutions!! I strongly suggest that you solve/write down your answers on paper before submitting them in the on-line exercises. Practice at quickly and accurately drawing structures on paper is very important. You will be asked to solve problems and write out solutions on the exams!

Use Models Lots of practice is required in going from the 2-dimensional world of the printed page to the 3-dimensional world where the molecules (and ourselves) exist. The molecular models will help you greatly in making that dimensional transition.

Laboratory Attendance: *Attendance in every scheduled laboratory, in your assigned section, is mandatory.* One missed lab is equal to a failure in the lab course. If you know of potential conflicts with your scheduled lab, you must make every effort to resolve those conflicts with a schedule change. Make up labs will be offered by instructor discretion, ONLY if you are very ill (bed-ridden), or if you notify your instructor in advance of a college-approved conflict with your normal lab session.

Because the lab sections may be full and other students still want to get into the lab, your instructor may drop you from his or her lab section if you fail to show up for lab in the first week of the semester.

Cell phones/pagers/other electronics

As a courtesy to your fellow classmates and instructor, please turn your cell phones, iPods, and any other electronic devices OFF during scheduled lecture and laboratory time. Use of a prohibited electronic device may result in dismissal from that class (at the instructor's discretion).

Grading:

Lecture:	
Four in-class exams:	45%
On-line Homework (Sapling exercises):	10%
Written Homework (handed in most Friday's):	5%
Final Exam (cumulative):	20%
Laboratory:	
Notebook Prelabs, Reports:	20%
	100%

Approximate Grading Scale: A: 100-92%; A-: 91-89; B+: 88-87; B: 86-82; B-: 81-79; C+: 78-77; C: 76-72; C-: 71-69; D+: 68-67; D: 66-62

At the discretion of the instructor, these cutoffs may be reduced. For example, if the final average of the class is lower than 77% (bottom of the C+ in the above scale), a student with an average score of 86 may receive a B+. However, I will not raise the grading scale even if the class average is higher than 77% (i.e. the student who averages an 82 will never receive a B-).

Notes:

- The Office of Student Advising (204 Johnson Student Union) is open daily to help students with study problems, time management problems, and other problems that might interfere with your ability to do your best work. Chemistry Tutors are also available Sunday through Thursday evenings in Nobel 305.
- There will not be any make-up exams or quizzes. If you must miss an exam because of an extreme circumstance, you must seek prior approval of the instructor.
- In the event classes are canceled because of weather, etc. on a date when a quiz or an exam was to be given, the exam or quiz will be given the next class meeting.
- If you feel there was an error in grading, you must see your instructor ***within one week of the return date***.
- If at any time during the quarter you have any questions regarding your current score and standing you are encouraged to see your instructor.

Academic Honesty: Every Gustavus Adolphus College student is required to sign the following statement before final admittance into the College and /or registration for fall courses:

"As a community of scholars, the faculty and students of Gustavus Adolphus College have formulated an academic honesty policy and honor code system, which is printed in the Academic Bulletin and in the Gustavus Guide. As a student at Gustavus Adolphus College I agree to uphold the honor code. This means that I will abide by the academic honesty policy, and abide by decisions of the joint student/faculty Honor Board."

The policy of the college states in part:

The faculty of Gustavus Adolphus College expects all students to adhere to the highest standards of academic honesty, and to refrain from any action which impinges upon academic freedom of other members of the college community. In all academic exercises, examinations, presentations, speeches, papers, and reports, students shall submit their own work.... In the case of cheating or plagiarism, the instructor will inform the student and the office of the Provost of the nature of the offense, the penalty within the course, and the recommendation of the instructor as to whether further disciplinary action is warranted.

I will expect the following honor code to be signed by you and handed in to me early in the first week of class.

"On my honor, I pledge that I will not give, receive, or tolerate others' use of unauthorized aid in completing exams or other appropriate (so designated) written assignments for this course.

I will then naturally expect you to function with integrity by abiding by this pledge for the duration of the course. The above pledge does not apply to homework, as explained below.

Since chemistry is a collaborative endeavor & you can benefit from working with others, you are encouraged to work with others on your **homework assignments (both Sapling & Hand-in)** and on end-of-chapter text problems. As stated above in the section on **Homework**, you still must turn in your own assignments done in your own hand! Also, realize that copying someone else's homework would do

nothing to help you at exam time! *If I determine that all or a portion of your submitted homework is an exact copy of someone else's, those homeworks will each receive a zero.*

In the case of **laboratory work**, you are expected to interact & collaborate with other students while you are working in the lab. This is normal and healthy practice when working in the lab. You are not prevented from discussing observations or results with other students. However, in most cases laboratory Reports should be completed individually. This means that it will be an honor code violation to use the narrative components of a laboratory report written by another individual. It will also be an honor code violation to present the data of another individual or laboratory group as your own without proper acknowledgment and instructor permission. Any question you have about the expectations for a particular experiment should be directed to your lab instructor.

An integral part of the honor code is non-tolerance of violations. Any student found in violation of the academic honesty policy and honor code will receive a grade of zero for that quiz, exam, lab, etc. In addition, the office of the Provost will be notified of the nature of the offense. Repetition may result in an 'F' for the course.

Services:

Disability Accommodations

Gustavus is committed to ensuring the full participation of all students in its programs. If you have a documented disability (or you think you may have a disability of any nature) and, as a result, need reasonable academic accommodation to participate in class, take exams, or benefit from the College's services, then you should speak with the Disability Services Coordinator, Laurie Bickett (lbickett@gustavus.edu or x6286) for a confidential discussion of your needs and appropriate plans. Course requirements cannot be waived, but reasonable accommodations may be provided based on disability documentation and course outcomes. Accommodations cannot be made retroactively; therefore, to maximize your academic success at Gustavus, please contact Disability Services as early as possible. Disability Services (https://gustavus.edu/advising/disability/) is located in the Advising and Counseling Center.

Help for Students Whose First Language is not English Support for English Language Learners (ELL) and Multiliingual students is available via the College's ELL Support staff person, Andrew Grace (agrace@gustavus.edu or x7395). He can meet individually with students to consult about academic tasks and to help students seek other means of support. In addition, ELL and multilingual students can seek help from peer tutors in the Writing Center.

PEER MENTORING PROGRAM

To help you develop strong learning skills and to better understand the ethos of scientific inquiry you will participate in a Peer Mentoring program. This program is funded with a grant from the Howard Hughes Medical Institute (HHMI). Our goal is to help you be more successful in biology, chemistry and other coursework.

Each week, you will meet with a small group of peers also enrolled in BIO102 and/or CHE141. The sessions are led by a junior or senior biology, chemistry or biochemistry major. The sessions involve activities where you will practice application and synthesis of concepts, and gain an enhanced understanding. There are three main types of activities:

1. Lecture and Laboratory content reinforcement and practice
2. Skill building
3. How to think and act like a scientist

You are required to sign up for a peer-mentoring group in NHS 121 on T, Feb.7th or W, Feb 8th between 5:00 and 9:00 pm. If you are enrolled in either BIO 102 Organismal Biology or CHE 141 Organic Chemistry, you will sign up for a group that will focus solely on that class. If you are enrolled in both BIO 102 and CHE 141, you will sign up for a group that does activities for both courses. Please bring your class and event schedule with you when you sign up for a peer mentoring group to help determine which time to sign up for. Peer mentors will be available to answer your questions.

You will meet with your group once a week in Nobel 121 or Nobel 106B. Bring a notebook and a pen/pencil to your session, and possibly a textbook. A computer may be needed to complete some of the activities, but you will not be allowed to use personal electronic devices such as phones, ipods, etc during your peer mentoring session. Ten sessions are planned for the weeks of: Feb. 12, 19, 26, Mar. 4, 11, 18, April 15, 22, 29, and May 6. There will be no sessions before or after Easter Break (week of March 25 and April 8). A list of the Peer Mentoring activities for the semester is on Moodle. **If you do not attend *and actively participate* in 8 of the 10 peer mentoring sessions, you will lose 5% of your final course points**. If you have any questions, please contact Pamela Kittelson, HHMI Peer Mentoring Coordinator at pkittels@gustavus.edu.

Tentative Class Schedule

Week	Topic	Lectures	Reading	Exam
1	Structure and Bonding (Check in and Urea Lab)	Feb. 6, 8, 9, 10	Chapter 1	**Hand-in Homework**
2	Polar Covalent Bonds; Acids and Bases (White Solids Lab)	Feb. 13, 15, 16, 17	Chapter 2	**Hand-in Homework**
3	Alkanes & Their Stereochemistry (White Solids Lab cont.)	Feb. 20, 22, 23	Chapter 3	Feb 24: **Exam 1**
4	Cycloalkanes & Their Stereochemist (Acid/Base Extraction Lab)	Feb. 27, 29, Mar. 1, 2	Chapter 4	**Hand-in Homework**
5	Stereochem at Tetrahedral Centers (Acid/Base Extraction cont.)	Mar. 5, 7, 8, 9	Chapter 5 (sec. 1 – 10)	**Hand-in Homework**
6	Stereochem at Tetrahedral Centers; Organic Reactions Overview (Chiral Resolution Lab)	Mar. 12, 14, 15	Chapter 5 (sec. 11 – 12) Chapter 6 (sec. 1 – 6)	Mar. 16: **Exam 2**
7	Organic Reactions Overview; Alkenes (Stereochem. of Brom. Lab)	Mar. 19, 21, 22, 23	Chapter 6 (sec. 7 – 11) Chapter 7 (sec. 1 – 6)	**Hand-in Homework**
8	Alkenes; Reactions of Alkenes (Terpenes Isolation Lab)	Mar. 26, 28, 29, 30	Chapter 7 (sec. 7 – 10) Chapter 8 (sec. 1-8)	**Hand-in Homework**
9	**Spring / Easter Break (March 31 – April 9)**			
10	Reactions of Alkenes (no lab this week)	Apr. 11, 12	Chapter 8 (sec. 9-14)	Apr. 13: **Exam 3**
11	IR, UV Spectroscopy; Mass Spectrometry (MS) NMR Spectroscopy (Terpenes Spectroscopy Lab)	Apr. 16, 18, 19, 20	Chapter 10; Chapter 11 (sec. 1-6)	**Hand-in Homework**
12	NMR Spectroscopy (Unknowns Qual. Lab)	Apr. 23, 25, 26, 27	Finish Chapter 11	**Hand-in Homework**
13	Aromatics (Unknowns Spectroscopy Lab) (Lab Checkout)	April 30, May 2, 3	Chapter 9 (sec. 1 – 5)	May 4: **Exam 4**
14	Alkyl halides; Substitution & Elimination (Unknowns Presentations)	May 7, 9, 10, 11	Chapter 12	**Hand-in Homework**
15	Alkyl halides; Substitution & Elimination	May 14, 16	Finish Chapter 12	**Final Exam: Tues. May 22, 3:30-5:30 NHS 222**