

ORGANIC CHEMISTRY I (CHEM 231) – FALL 2009

This syllabus subject to change pending notification verbally in class or via the email list.

MWF 9:10 – 10:00 am, Hayes 109

Prof. Yutan Getzler

Office: Tomsich Hall 308

Office hours: Mon & Wed, 10 am – 12 pm, Mon & Wed 1 pm – 2 pm, or by appointment.

PBX: 5304

email: getzlery

website: <http://chemistry.kenyon.edu/faculty/getzler.htm>

Text: Vollhardt, K. Peter C.; Schore, Neil E. Organic Chemistry: Structure and Function, 5th edition

Optional: Schore, Neil E. Study Guide and Solutions Manual for Organic Chemistry, 5th edition

On reserve in library: Silverstein, R. M; Webster, F. X. Spectrometric Identification of Organic Compounds, 6th edition (for NMR & IR sections)

Material: HGS Molecular Structure Model Kit (same as used in CHEM 12X sequence)

Point Distribution:

| | |
|--------------------------------------|-----------|
| Weekly quizzes (12 @ 10 point each) | 120 |
| Spectroscopy Problem Set (due 10/16) | 30 |
| 3 Midterm Exams @ 100 points each | 300 |
| Final Exam | 300 |
| Problem presentation & homework | 200 |
| <u>Class participation</u> | <u>50</u> |
| Total | 1000 |

Exam Schedule:

| <u>Exam</u> | <u>New Chapters</u> | <u>Date & Time</u> |
|-------------|------------------------|---|
| Exam I | 1 – 4, part of 5 | Fri, Sept. 25 th |
| Exam II | 5 – 6, 10 & part of 11 | Mon, Oct. 26 th |
| Exam III | 7, 8 & part of 9 | Fri, Nov. 20 th |
| Final | part of 9 & 11 – 12 | Sun, Dec 20 th , 8:30 – 11:30 am |

Goals: This course can change the way you think of the physical world. Chemistry 231 provides a foundation for other courses at Kenyon, including Organic Chemistry II (Chem 232) Advanced Organic Chemistry (Chem 453), Biochemistry (Chem 356), Advanced Biochemistry (Chem 460), and Molecular Genetics (Bio 363). By the end of academic year, you should be able to understanding much of organic chemistry research.

Attendance: The material you will be expected to know for this course continuously builds on itself. It is quite easy to get behind if you miss a topic. Thus, class attendance is mandatory. As stated in the college policy:

“Absences for reasons of illness are not ordinarily excused: only when a student is declared by the College physician to be infirm (in a hospital or at home) will a health report be sent from the Health and Counseling Center to the Dean of Students, giving the days when each patient is judged infirm and recommending that the student’s class absences be excused.”

ONLY the Dean of Students (NOT the instructor) offers an Excused Absence. If you miss in-class assignments or exams due to severe illness or emergency, your name must appear on the Dean of Students *Excused*

Absence List in order to make up the work; otherwise a failing grade will be given. In the event of an absence from class, the student is responsible for securing any notes, handouts or announcements from the class.

Student-Athletes: Note the college policy on attendance in the *Scheduling Guidelines for Athletic Contests* (<http://www.kenyon.edu/PreBuilt/provCASatleticsgl.doc>) . By the end of the first week of classes, please notify me of all potential athletic conflicts, which should not exceed 10% of our meeting times (4 classes).

Studying: To thrive in this class, most Kenyon students will need to devote *9 hours minimum per week outside the classroom* to studying. There are many potentially effective strategies for success. Read the text to be covered in class before coming to class. Take advantage of the Math and Science Skills Center (biology.kenyon.edu/HHMI/math-science/). Work through the exercises and end-of-chapter problems, and not just the assigned ones. Work through them three or four times. Recopy your notes after each lecture. Make a slide-show of reactions you are trying to learn and play it as your screen-saver. Most importantly, ask question in class and during office hours. I also believe your model kits are essential. Familiarity with three-dimensional structure is a crucial skill for organic chemistry and one often neglected by students.

In-class problem presentations: At the beginning of each class, when there is no exam or quiz, one or two students will be called to the board to present a homework problem. The presentation cannot last beyond 9:13 am (9:16 am if there are two presentations). Once the problem has been presented, I will ask one follow-up question. If you are not present, you will receive no credit. These presentations will be graded in the following manner: preparation/accuracy – 70%, time – 20%, follow-up question – 10%. I will cut you off at the end of the time period, which may cut into the accuracy of your presentation. You have one free pass to not be called to the board, which I will consider used if you are absent when your name is called.

Quiz: Every Friday on which there is not an exam there will a quiz consisting of one of the homework questions assigned in the prior two weeks of class. The quiz will end promptly at 9:15 am.

Homework: Every class, a few randomly selected students may be asked to hand in the homework problems. If you are absent, you will receive no credit for this assignment. As above, you have one free pass.

Class participation: I will call on you to answer relevant questions; evaluation is on a 0, \checkmark -, \checkmark , \checkmark + basis. Asking a question relevant to the intellectual content of the course counts towards your participation grade.

Exams: The first three exams will be 1.83 hours long, running either from 8:10 to 10:00 or 9:10 to 11:00. The choice is yours, but you must inform me one week in advance if you plan to use the latter slot. While the focus of each exam will be the material covered since the last exam, you must be familiar with basic concepts (stoichiometry, conformational analysis, etc) from earlier in the semester and prior courses. The final will be cumulative with approximately half the material coming *directly* from prior exams.

Academic Honesty: You will follow the college policy for academic honesty (*KC Course of Study 2009-2010*; <http://www.kenyon.edu/x11747.xml>). All materials submitted for credit must be your own work. I hold you responsible for ensuring each others' honesty; if you know of a violation, please promptly relay your concerns to myself or the Dean of Students.

Section 504 of the Rehabilitation Act (1973) & ADA (1990): If your disability requires accommodation to fully participate in this class, identify yourself to Erin Salva, Coordinator of Disability Services (PBX 5453, salvae@kenyon.edu). All information and documentation of disability is confidential. No accommodations of any kind will be given in this course without notification from the Coordinator of Disability Services.

| Date | Topic: <i>Planned Schedule & Reading Assignments</i> | Book |
|------|--|------|
|------|--|------|

REVIEW OF BONDING & STRUCTURE

| | | |
|--------|--|-----------|
| M 8/31 | Basics of Bonding – Coulomb, Octet Rule, Lewis Representation | 1-1 to -5 |
| W 9/2 | Quantum Description, Orbitals, Structures & Formulas | 1-6 to -9 |
| F 9/4 | Thermodynamics, Kinetics, Acids, Bases & Other Functional Groups | 2-1 to -3 |

ALKANES – STRUCTURE & REACTIVITY

| | | |
|--------|--|------------|
| M 9/7 | Alkanes – Names, Structures & Properties | 2-4 to -6 |
| W 9/9 | Alkanes – Conformations & Bond Strength | 2-7 to 3.1 |
| F 9/11 | Radicals – Structure, Uses, Radical Chain Mechanism | 3-1 to -4 |
| M 9/14 | Radical Halogenations – Reactivity and Selectivity | 3-5 to -7 |
| W 9/16 | Synthetic Halogenation, CFCs & Alkane Stability | 3-8 to -10 |
| F 9/18 | Carbocycles – Nomenclature, Structure, Strain, & Cyclohexane Intro | 4-1 to -3 |
| M 9/21 | Cyclohexane, Larger Ring, Polycyclic Alkanes | 4-3 to -7 |

STEREOCHEMISTRY & SPECTROSCOPY

| | | |
|---------------|--|------------------|
| W 9/23 | Isomerism, Chirality & Optical Rotation | 5-1 to -2 |
| F 9/25 | Exam I covering material including 9/23 – No class 9/28 (Yom Kippur) | |
| W 9/30 | Absolute Configuration & Fischer Projections | 5-3 to -4 |
| F 10/2 | Diastereomers, Meso Compounds & Reaction Stereochemistry | 5-5 to -7 |
| M 10/5 | Spectroscopy, Magnetic Resonance and ¹ H Chemical Shift | 10-1 to -4 |
| W 10/7 | Degree of Unsaturation, Chemical Equivalence, Integration & Splitting | 11-8, 10-5 to -7 |
| F 10/9 | More Splitting, ¹³ C & 2-D NMR – No Class 10/12; October Reading Days | 10-7 to -9 |
| W 10/14 | Alkene NMR & IR, MS | 11-4 to -7 |

INTRODUCTION TO SUBSTITUTION & ELIMINATION REACTIONS

| | | |
|----------------|---|------------|
| F 10/16 | Haloalkane Properties, Nucleophilic Substitution & Arrow Pushing | 6-1 to -3 |
| M 10/18 | Kinetics and Stereochemistry of Nucleophilic Substitution | 6-4 to -6 |
| W 10/21 | Influence of the Leaving Group and Solvent | 6-7 to -8 |
| F 10/23 | Influence of Sterics – Nucleophile & Substrate | 6-8 to -9 |
| M 10/26 | Exam II covering material including 10/23 | |
| W 10/28 | Solvolysis, Unimolecular Substitution & Stereochemical Consequences | 7-1 to -3 |
| F 10/30 | Effects of Solvent, Nucleophile, Substrate & Leaving Group | 7-4 to -5 |
| M 11/2 | Elimination Reactions | 7-6 to -7 |
| W 11/4 | Substitution vs Elimination & Chapter Review | 7-8 to -9 |
| F 11/6 | Alcohols – Nomenclature, Structure, Properties & Industrial Preparation | 8-1 to -4 |
| M 11/9 | Alcohol Synthesis – Nucleophilic, Redox, Organometallic | 8-5 to -7 |
| W 11/11 | Alcohol Synthesis – Organometallic Reagents & Synthetic Strategy | 8-8 to -9 |
| F 11/13 | Alcohol Reactions - Acid/Base & Carbocation | 9-1 to -3 |
| M 11/16 | Esters from Alcohols; Ether Nomenclature, Properties & Williamson Synthesis | 9-4 to -6 |
| W 11/18 | [flex day for childbirth] | |
| F 11/20 | Exam III – covering material including 11/18 – fall break | |
| M 11/30 | Ethers – Synthesis and Reactions | 9-6 to -8 |
| W 12/2 | Reactions of Epoxides, Sulfur Analogues & Physiological Relevance | 9-9 to -11 |

ALKENES

| | | |
|---------|--|--------------|
| F 12/4 | Nomenclature, Structure & Properties | 11-1 to -3 |
| M 12/7 | Thermodynamics & Synthesis | 11-9 to -11 |
| W 12/9 | Reactions | 12-11 to -3 |
| F 12/11 | Electrophilic Add'n of HX, H ₂ O & X ₂ | 12-3 to -5 |
| M 12/14 | General Electrophilic Add'ns, ±Hg, Hydroboration-Oxidation | 12-6 to -8 |
| W 12/16 | Cyclopropanation, Epoxidation, Dihydroxylation | 12-8 to -11 |
| F 12/18 | Ozonolysis, Radical Add'ns, Polymerizations | 12-12 to -15 |

