

ORGANIC CHEMISTRY I (CHEM 231) – FALL 2005

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://chem.kenyon.edu/faculty/getzler/05F-CHEM231.html>

Text: Vollhardt, K. Peter C.; Schore, Neil E. Organic Chemistry: Structure and Function, 4th edition
Optional: Schore, Neil E. Study Guide and Solutions Manual for Organic Chemistry, 3rd edition
On reserve in library: Silverstein, R. M; Webster, F. X. Spectrometric Identification of Organic Compounds, 6th edition (for NMR & IR sections)
Material: Molecular Visions Molecular Model Kit

Point Distribution:

3 Midterm Exams @ 150 points each	450
Final Exam	300
Problem presentation & homework	200
<u>Class participation</u>	<u>50</u>
Total	1000

Exam Schedule:

<u>Exam</u>	<u>Primary Content</u>	<u>Date & Time</u>
Midterm I	Chs. 1 – 4	Fri, Sept. 23 rd , ends 10:00 am
Midterm II	Chs. 5 – 6, 10 & 11	Fri, Oct. 21 st , ends 10:00 am
Midterm III	Chs. 7 – 9	Fri, Nov. 18 th , ends 10:00 am
Final	Chs. 11 – 12	Sat, Dec 17 th , 8:30 – 11:30 am

Rules for the Course:

Goals: This course can change the way you think of the physical world. Chemistry 231 provides a foundation of knowledge for other science 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). Furthermore, by the end of academic year, you should be able to read and understand current published research in organic chemistry.

Attendance: This 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 particular topic. Therefore class attendance is mandatory. Also, see in-class problem presentation below.

Prerequisite: By far the most important prerequisite for this course is a mind which is both curious and skeptical. Organic chemistry is a science that continually builds upon itself, and this course is dependent taught in General Chemistry.

Studying: To be successful in this class, most Kenyon students will need to devote *9 hours minimum per week* to studying for this course outside of our normal meeting time. There are many potentially effective strategies for success in this course. Read the sections of the text to be covered in class before coming to class. Work through the appropriate exercises and end-of-chapter problems. 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, come talk to me during office hours and go to the study-sessions held by the course TA. I also very strongly suggest you use your model kits. On some days you *must* bring them to class, and I encourage you to get in the habit of using them in and out of class. Familiarity with three-dimensional structure is among the most crucial skills for organic chemistry.

Exams: All exams will be administered during regularly scheduled class times. Thus, the exam must end promptly at 10:00 am. You are welcome to start the exam earlier, but you must inform me, by email, by noon of the day before the exam. I reserve the right to determine what time is too early. The start time of the exam will be posted on the course website, so check there before you send me an email. I will be available on the Wednesdays evenings of exam weeks (on Thursday evening before the final) for a purely voluntary question/answer session, time and location TBA. While the primary content of any exam will be the material most recently covered, you must be familiar with basic concepts (stoichiometry, computation of molecular weight, etc) from earlier in the semester and prior courses.

In-class problem presentations: At the beginning of each class one or two students will randomly be assigned to come to the board and present one of the assigned homework problems. The presentation can not last beyond 9:15 am (9:20 am if there are two presentations). I will ask you one in-depth follow-up question. If you are not present, you will receive no credit for this assignment. These presentations will be graded in the following manner: preparation/accuracy – 60%, time – 20%, follow-up question – 20%.

Homework: Every class, a number of randomly selected students will be asked to hand in the assigned homework problems. If you are absent, you will receive no credit for this assignment. Between the in-class presentation and the submitted homework, you will be evaluated at least twice during the semester.

Class participation: I will call on you by name in class to answer relevant questions; evaluation is on a 0, ✓-, ✓, ✓+ basis. Asking a question which is relevant to the intellectual content of the course also counts towards your class participation grade.

Academic Honesty: You must follow the college policy for academic honesty as outlined in the “Kenyon College Course of Study 2005-2006,” pp 26-29. All materials submitted for credit must be your own work. http://www1.kenyon.edu/academics/cos/2005-06/downloads/acad_honesty.pdf

Section 504 of the Rehabilitation Act of 1973 and the Americans with Disabilities Act of 1990: If you have a disability and need accommodation in order to fully participate in this class, please identify yourself to Erin Salva, Coordinator of Disability Services (PBX 5145, 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>Tentative Schedule & Reading Assignments</i>	Book
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REVIEW OF BONDING & STRUCTURE

M 8/29	Basics of Bonding – Coulomb, Octet Rule, Lewis Representation	1.1 – 1.5
W 8/31	Quantum Description, Orbitals, Structures & Formulas	1.6 – 1.9
F 9/2	Thermodynamics, Kinetics, Acids, Bases & Other Functional Groups	2.1 – 2.3

ALKANES – STRUCTURE & REACTIVITY

M 9/5	Alkanes – Names, Structures & Properties	2.4 – 2.6
W 9/7	Alkanes – Conformations & Bond Strength	2.7 – 3.1
F 9/9	Radicals – Structure, Uses, Radical Chain Mechanism	3.1 – 3.4
M 9/12	Radical Halogenations – Reactivity and Selectivity	3.5 – 3.7
W 9/14	Synthetic Halogenation, CFCs & Alkane Stability	3.8 – 3.10
F 9/16	Carbocycles – Nomenclature, Structure, Strain, & Cyclohexane Intro	4.1 – 4.3
M 9/19	Cyclohexane, Larger Ring, Polycyclic Alkanes – <i>bring cyclohexane model</i>	4.3 – 4.7

STEREOCHEMISTRY & SPECTROSCOPY

W 9/21	Isomerism, Chirality & Optical Rotation	5.1 – 5.2
F 9/23	<i>Exam I covering material until 9/21</i>	
M 9/26	Absolute Configuration & Fischer Projections	5.3 – 5.4
W 9/28	Diastereomers, Meso Compounds & Reaction Stereochemistry	5.5 – 5.7
F 9/30	Spectroscopy, Magnetic Resonance and ¹ H Chemical Shift	10.1 – 10.4
M 10/3	Chemical Equivalence, Integration & Splitting	10.5 – 10.7
W 10/5	Splitting Complications, ¹³ C NMR, 2-D NMR	10.7 – 10.9
F 10/7	Alkene NMR, IR & Degree of Unsaturation	11.4 – 11.6
M 10/10	<i>No Class - October Reading Days</i>	

INTRODUCTION TO SUBSTITUTION & ELIMINATION REACTIONS

W 10/12	Haloalkane Properties, Nucleophilic Substitution & Arrow Pushing	6.1 – 6.3
F 10/14	Kinetics and Stereochemistry of Nucleophilic Substitution	6.4 – 6.6
M 10/17	Influence of the Leaving Group and Solvent	6.7 – 6.8
W 10/19	Influence of Sterics – Nucleophile & Substrate	6.8 – 6.9
F 10/21	<i>Exam II covering material until 10/19</i>	
M 10/24	Solvolysis, Unimolecular Substitution & Stereochemical Consequences	7.1 – 7.3
W 10/26	Effects of Solvent, Nucleophile, Substrate & Leaving Group	7.4 – 7.5
F 10/28	Elimination Reactions	7.6 – 7.7
M 10/31	Substitution vs Elimination & Chapter Review	7.8 – 7.9
W 11/2	Alcohols – Nomenclature, Structure, Properties & Industrial Preparation	8.1 – 8.4
F 11/4	Alcohol Synthesis – Nucleophilic, Redox, Organometallic	8.5 – 8.7
M 11/7	Alcohol Synthesis – Organometallic Reagents & Synthetic Strategy	8.8 – 8.9
W 11/9	Alcohol Reactions - Acid/Base & Carbocation	9.1 – 9.3
F 11/11	Esters from Alcohols; Ether Nomenclature, Properties & Williamson Synthesis	9.4 – 9.6
M 11/14	Ethers – Synthesis and Reactions	9.6 – 9.8
W 11/16	Reactions of Epoxides, Sulfur Analogues & Physiological Relevance	9.9 – 9.11
F 11/18	<i>Exam III – covering material until 11/16 – NO CLASS until 11/28 – fall break</i>	

ALKENES

M 11/28	Nomenclature, Structure & Properties	11.1 – 11.3
W 11/30	Thermodynamics & Synthesis	11.7 – 11.8
F 12/2	Synthesis & Reactions	11.9 – 12.2
M 12/5	Electrophilic Addition of HX, H ₂ O & X ₂	12.3 – 12.5
W 12/7	Bromonium Ion, General Electrophilic Addition, Oxymercuration-Demercuration	12.5 – 12.7
F 12/9	Hydroboration-Oxidation, Cyclopropanation, Epoxidation	12.8 – 12.10
M 12/12	Dihydroxylation, Ozonolysis, Radical Additions	12.11 – 12.13

Appendix I - *The Purpose of the ACS Standardized Exam*

The Kenyon College Department of Chemistry and Biochemistry administers a form of the American Chemical Society (ACS) Organic exam twice each year. All students entering organic chemistry take the exam during the first session of organic lab (Chem 233). All students completing the second semester of organic lecture (Chem 232) take the exam as part of their final.

This multiple choice exam is comprehensive, covering all aspects of organic chemistry. It may include topics not taught in the courses you take here at Kenyon. You will be allowed a maximum of 120 minutes to complete the exam and you should try your best to answer accurately.

The ACS Organic exam is administered for three important reasons. The order in which they are listed is arbitrary and does not denote relative importance.

- 1) As this exam is administered every year to all students at the beginning and end of the course, the total average change in score may allow the Department to determine if the quality of instruction has significantly improved or degraded between years.
- 2) The majority of the you passing through the organic sequence will encounter some future standardized examination of your knowledge of the subject. Thus, it would be a disservice to you if you did not encounter such a test during your time at Kenyon.
- 3) The ACS tracks the scores of students nationally. Administering this exam gives the department a sense of what material you are learning relative to what is being taught nationally.