

# ORGANIC CHEMISTRY II (CHEM 232) – SPRING 2007

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 308  
*Office hours:* Mon 10 am – 12 pm, Tues 10 am – 11 am, Wed 10 am – 12 pm, or by appointment  
*PBX:* 5304  
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**Text:** Vollhardt, K. Peter C.; Schore, Neil E. Organic Chemistry: Structure and Function, 5<sup>th</sup> edition  
**Optional:** Schore, Neil E. Study Guide and Solutions Manual for Organic Chemistry, 5<sup>th</sup> edition  
*On reserve in library:* Silverstein, R. M; Webster, F. X. Spectrometric Identification of Organic Compounds, 6<sup>th</sup> edition (for NMR & IR)  
**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 &amp; Time</u>
Midterm I	Chs. 17, 18	F, Feb 9 <sup>th</sup> , 8:00 – 10:00 am
Midterm II	Chs. 19, 20	F, Mar 2 <sup>nd</sup> , 8:00 – 10:00 am
Midterm III	3/19 – 4/11	F, Apr 13 <sup>th</sup> , 8:00 – 10:00 am
Final	ACS; Chs. 14 – 16	Th, May 10 <sup>th</sup> , 8:30 am

**Goals:** Chemistry 232 provides a foundation of knowledge for other science courses at Kenyon, such as Advanced Organic Chemistry (Chemistry 453), Biochemistry (Chemistry 356), Advanced Biochemistry (Chemistry 460), and Molecular Genetics (Biology 363). By the end of the semester you should be able to read and understand much of the current published original research in organic chemistry. By the end of the semester you should have a better understanding of how the world works.

**Attendance:** As you already know by now from your experience in Chemistry 231, it is quite easy to get behind if you miss a particular topic. Also see in-class problem presentation below.

**Prerequisite:** By far the most important prerequisite for this course is a mind that is both curious and skeptical. Organic chemistry is a science that continually builds upon itself, and this course is acutely dependent upon your working knowledge of Chemistry 231 (first semester) material. As such exams in this course will contain topics from Chemistry 231. For example, you should continue to know how to synthesize alcohol, alkyl halides, etc.

**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 are in Hayes 109. To allow for ample time on exams, they are scheduled for Friday mornings, starting at 8:00 am. If so requested, via email, I will make the exam available as early as 7:00 am. Alternate exam times are available only for scheduled academic conflicts. 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. The final will be cumulative with approximately half the material coming from earlier in the course

**In-class problem presentations:** At the beginning of each class one or two students will randomly be assigned to come to the board and solve one of the suggested problems from last lecture. The presentation cannot last beyond 9:15 am (9:20 am if there are two presentations). 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%, presentation – 20%, time – 20%. I will cut you off at the end of the time period, which may also 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.

**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 relevant to the intellectual content of the course also counts towards your class participation grade.

**Academic Honesty:** You are expected to follow the college policy for academic honesty (*Kenyon College Course of Study 2006-2007*, pp 26 – 29; [http://documents.kenyon.edu/courses/2006\\_2007/honesty.pdf](http://documents.kenyon.edu/courses/2006_2007/honesty.pdf)). All materials submitted for credit must be your own work. All academic infraction will be forwarded to the Academic Infractions Board and may result in a grade of F for the course, suspension or expulsion.

**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](mailto: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.

## Tentative Schedule &amp; Reading Assignments:

Date	Topic	Section in V & S
<b>ALDEHYDES &amp; KETONES</b>		
M 1/15	Structure, Nomenclature, & Ppn of Aldehydes & Ketones	17-1, 17-2, 17-4
W 1/17	Addition Rxns of Aldehydes & Ketones / Acetals	17-5 to 17-7
F 1/19	Acetals as Protecting Groups / Desulfurization	17-8
M 1/22	Imines & Enamines	17-9
W 1/24	Wolff-Kishner Reduction / Cyanohydrins	17-10, 17-11
F 1/26	The Wittig Rxn / The Baeyer-Villiger Oxidation	17-12, 17-13
M 1/29	Enolates, Keto-Enol Equilibria / Deuterium Exchange / Stereoisomerization	18-1, 18-2
W 1/31	Halogenation & Alkylation of Aldehydes & Ketones	18-3, 18-4
F 2/2	The Aldol Addition Rxn & Condensation / Crossed Aldol Condensation	18-5, 18-6
M 2/5	Intramolecular Aldol Condensation / Conjugate Addition	18-7, 18-9, 18-10
W 2/7	The Michael Addition / The Robinson Annulation	18-11
<b>F 2/9</b>	<b>Exam I – covering material until 2/7</b>	
M 2/12	Claisen & Dieckmann Condensations, The Acetoacetic Synthesis	23-1, 23-2
W 2/14	Malonic Ester Synthesis, Michael Addition, Acyl anion equivalents	23-2, 23-3, 23-4
<b>CARBOXYLIC ACIDS &amp; THEIR DERIVATIVES</b>		
F 2/16	Nomenclature & Physical Properties of Carboxylic Acids	19-1, 19-2
M 2/19	Acid-Base Properties & Ppn of Carboxylic Acids	19-4, 19-6
W 2/21	Ppn of Acyl Halides, Anhydrides, & Esters / The Fischer Esterification	19-8, 19-9
F 2/23	Ppn of Amides, Alcohols, $\alpha$ -Bromocarboxylic Acids / Hell-Volhard-Zelinsky Rxn	19-10 to 19-12
M 2/26	The Addition-Elimination Mechanism / Rxns of Acyl Halides	19-7, 20-1, 20-2
W 2/28	Rxns of Anhydrides & Esters	20-3, 20-4
<b>F 3/2</b>	<b>Exam II – covering material until 2/28 – spring break</b>	
M 3/19	More Rxns of Esters	20-4
W 3/21	Rxns of Amides & Nitriles / The Hofmann Rearrangement	20-6 to 20-8
<b>SPECIAL TOPIC: O-CHEM of BIOLOGICAL PATHWAYS</b>		<i>For next class</i>
F 3/23	Common Biological Acids & Bases, $pK_a$ and Analogous Biological Reactions	<i>No Problems</i>
M 3/26	Catalysis, Common Coenzymes/Functions and Sample Reactions	<i>Probs: 1.12 – 1.16</i>
W 3/28	Coupled rxns, ATP $\rightarrow$ acetyl CoA, General Acid/Base	<i>No Problems</i>
F 3/30	Catalytic Triad & Oxyanion Hole (1 $^\circ$ lit on P drive)	<i>Handout</i>
4/2, 4/4	Baby Time	
W 4/6	Specific Pathways – Cytidine Catabolism & Biosynthesis (Ch 6 on P drive)	6.1, 2, 4, 5, 8,
M 4/9	Pyridoxal Phosphate (PLP) – A Versatile Cofactor	6.6, 9
W 4/11	Choose Your Own Adventure – Natural Product Biosynthesis Edition:	5.1, 6, 10, 11, 14
	Penicillins/Cephalosporins, Morphine, Prostaglandins or Erythromycin	
<b>F 4/13</b>	<b>Exam III – covering material until 4/11</b>	
<b>DIENES &amp; AROMATICS</b>		
M 4/16	Stability of Dienes / The Diels-Alder Rxn	14-5, 14-8
W 4/18	Structure, Resonance Energy, & Nomenclature of Benzenes	15-1, -2, -3, -5
F 4/20	Aromaticity: Hückel's Rule	15-6, 15-7
M 4/23	Electrophilic Aromatic Substitution: Halogenation, Nitration, & Sulfonation	15-8 to 15-10
W 4/25	Electrophilic Aromatic Substitution: The Friedel-Crafts Rxns	15-11 to 15-13
F 4/27	Electrophilic Attack on Substituted Benzenes: Control of Regioselectivity	16-1 to 16-3
M 4/30	Electrophilic Attack on Disubstituted Benzenes, Reductions, Synthetic Strategies	16-4, 16-5
W 5/2	Electrophilic Attack on Naphthalene / Nucleophilic Aromatic Substitution	16-6, 22-1, 22-4