

# CHEMISTRY 231 – ORGANIC CHEMISTRY I

## SPRING 2019

MWF 8:10-9:00 or MWF 9:10-10:00 am, RBH 109

### Instructor: Professor Mo Hunsen

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Office Telephone: 427-5091

Office Hours: MWF 10 - 11 AM & Tuesdays 12 - 1:30 PM. You are welcome, encouraged, and expected to meet with me throughout the semester.

**Text:** Vollhardt, K. Peter C.; Schore, Neil E. "Organic Chemistry: Structure and Function," 6<sup>th</sup> ed.

**Optional:** Schore, Neil E. "Study Guide and Solutions Manual for Organic Chemistry," 6<sup>th</sup> ed.  
HGS Molecular Structure Model Kit (same as used in CHEM 12X sequence)

### Point Distribution:

2 Midterm Exams	200
Best 6 out of 7 Quizzes @ 10 points each	60
Literature Homework Assignment (Due: TBA)	55
Class participation	45
Spectroscopy exam (take home)	40
Final Exam	100
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Total	500

### Exam Schedule:

Midterm Exam I	Topics covered by Feb 25 <sup>th</sup>	Feb. 25 <sup>th</sup>
Spectroscopy exam	(take home) is due on	March 1 <sup>st</sup>
Midterm Exam II	Topics covered by April 19 <sup>th</sup>	April 19 <sup>th</sup>
Final Exam	Comprehensive with a focus on topics not covered in mid-term exams	see Final exam schedule.

**Goals:** Chemistry 231 provides a foundation of knowledge for other science courses at Kenyon, such as Organic Chemistry II (Chem 232), Advanced Chemistry (Chemistry 401), Biochemistry (Chemistry 256), and Molecular Genetics (Biology 263). It is one of the elective advanced courses in chemistry. In addition, after taking the chem 231- 232 sequence you should be able to read and understand a large amount of the current published original research in organic chemistry.

**Attendance:** As you already know by now from your experience in other Chemistry courses, it is quite easy to get behind if you miss a topic. Therefore, other than excused absences, class attendance is mandatory.

**Prerequisite:** Organic chemistry is a science that continually builds upon itself, and this course is dependent upon your working knowledge of Introductory Chemistry material.

**ATTENTION:** The ACS exam given at the end of chem 232 **will** contain topics from Chemistry 231.

**Studying:** You should devote *9 hours minimum* per week to studying for this course outside of our normal meeting time. Suggested exercises assigned within each chapter should be solved as you read the text, and the appropriate problems located at the end of each chapter should be worked on soon after the text section has been covered (see the **Tentative Schedule and Reading Assignments** on the next page). While the suggested exercises and problems from the text will not be turned in to be graded, I strongly recommended that you do them regularly and earnestly. After making a real effort to work each assigned exercise or problem, the answer should be consulted in Appendix A of the text (exercises) or the Study Guide and Solutions Manual (problems). Students unable to solve an exercise or problem are encouraged to ask me for help! The tutor of this course will arrange a convenient time and place for review sessions.

**Quizzes:** A quiz will be given as scheduled (See **Tentative Schedule**). Some quizzes will be of the "take home" variety and may be worked on individually or in pairs.

**Group Project:** A group project that focuses on topics relevant to that covered in class will be assigned. The deliverables include an oral presentation (10 minutes) and a report (approximately 4-6 typewritten pages). The report is to be typewritten using the template provided by the instructor and will be due a week after your in-class presentation. All structures must be drawn using ChemDraw which as a free download at <http://scistore.cambridgesoft.com/sitelicense.cfm>.

**Academic Integrity:** At Kenyon we expect all students, always, to submit work that represents the highest standards of academic integrity. It is the responsibility of each student to learn and practice the proper ways of documenting and acknowledging those whose ideas and words they have drawn upon (see Academic Honesty and Questions of Plagiarism in the Course Catalog). Ignorance and carelessness are not excuses for academic dishonesty. If you are uncertain about the expectations for this class, please ask for clarification.

**Electronic Device Policy:** Active participation and full engagement is critical for your success in this course. As such all electronic devices should be turned off before the beginning of every lecture.

**Section 504 of the Rehabilitation Act of 1973 and the Americans with Disabilities Act of 1990:** Students who anticipate they may need accommodations in this course because of the impact of a learning, physical, or psychological disability are encouraged to meet with me privately early in the semester to discuss their concerns. In addition, students must contact Erin Salva, Director of Student Accessibility and Support Services (740-427-5453 or [salvae@kenyon.edu](mailto:salvae@kenyon.edu)), as soon as possible, to verify their eligibility for reasonable academic accommodations.

**Title IX Responsibilities:** As a faculty member, I am deeply invested in the well-being of each student I teach. I am here to assist you with your work in this course. If you come to me with non-course-related concerns, I will do my best to help. It is important for you to know that all faculty members are mandated reporters of any incidents of harassment, discrimination, and intimate partner violence and stalking. Meaning, I cannot keep information involving sexual harassment, sexual misconduct, interpersonal violence, any other form of harassment or discrimination based on a protected characteristic confidential. The Health and Counseling Center, the College chaplains, and the staff at New Directions Domestic Abuse Shelter & Rape Crisis are confidential resources.

**This syllabus is subject to change at my discretion. I will notify you of any changes in class and/or by email.**

## Tentative Schedule

*Date*

*Topic*

*Reading*

### THE BASICS

M-F	01/14 to 01/18	Ionic and Covalent Bonding; Octet Rule; Lewis Structures; Formal Charge; Resonance; Atomic Orbitals; Molecular Orbitals; Hybrid Orbitals	Ch 1 11.11
M-F	01/21 To 01/25	Functional Groups; Alkanes: Names, Structure, Conformations; Potential Energy Diagrams; Thermodynamics; Kinetics; Acids and Bases; Electrophiles and nucleophiles	Ch 2  <b>Quiz 1&amp;2</b>

### NMR AND IR SPECTROSCOPY

M-F	01/28 To 02/01	Proton Nuclear Magnetic Resonance ( $^1\text{H}$ NMR); Chemical Shift; Symmetry Tests for Proton Equivalence; Integration	Ch 10
M-F	02/04 To 02/08	Spin-Spin Coupling; Complications of Spin-Spin Coupling; Spectral Examples Carbon-13 Nuclear Magnetic Resonance ( $^{13}\text{C}$ NMR) Spectral Examples	11-4, 13-3, 15-4, 17-3, 19-3, 21-3 10-9,11-4,13-3,15-4
M-W	02/11 To 02/13	Physical Properties of Alkenes; Infrared Spectroscopy (IR); Deg. of Unsaturation In-Class Spectral Problems	11-3, 11-5; 11-8

### THE FUNDAMENTALS

F-F	02/15 To 02/22	Bond Dissociation Energies; Radicals; Chlorination of Methane; Hyperconjugation; Halogenations of Methane; Chlorination of Higher Alkanes; Halogenations of Higher Alkanes; Synthetic Utility of Halogenation	Ch 3 <b>Quiz 3</b>
<b>M</b>	<b>02/25</b>	<b>Midterm Exam I</b> <b>Spectroscopy take home exam is due on March 1<sup>st</sup></b>	<b>EXAM - I</b>
W-F	02/27 To 03/01	Cycloalkanes: Nomenclature; Ring Strain; Conformations Substituted Cyclohexanes; Polycyclic Alkanes	Ch 4
		<b>Spring Break -- Enjoy!</b>	
M-F	03/18 To 03/22	Chirality; Enantiomers; Optical Activity; Absolute Configuration Fischer Projections; Diastereomers; Meso Compounds ; Stereochemistry in Chemical Reactions	Ch 5  <b>Quiz 4</b>

## SUBSTITUTION AND ELIMINATION REACTIONS (SER)

M- To M	03/25 To 04/01	Properties of Alkyl Halides; S <sub>N</sub> 2 Reaction; Curved-Arrow Formalism Stereochemical Consequences of the S <sub>N</sub> 2 Reaction Effects of Leaving Group, Nucleophile, and Steric Hindrance of Alkyl Groups in the S <sub>N</sub> 2 Reaction	Ch 6  <b>Quiz 5</b>
W- To F	04/03 To 04/12	SN1 Reaction; Stereochemical Consequences of the S <sub>N</sub> 1 Reaction; Effects of Solvent, Leaving Group, Nucleophile, and Branching in the S <sub>N</sub> 1 Reaction Nomenclature of Alkenes; E1 Reaction; Relative Stability of Double Bonds; E2 Reaction; Stereochemical Consequences of the E2 Reaction Competition Between Substitution and Elimination;	Ch 7 11-1; 11-9 11-10  <b>Quiz 6</b>
<b>F</b>	<b>04/19</b>	<b>Midterm Exam II</b>	<b>EXAM - II</b>

## ALCOHOLS

M- To M	04/15 To 04/22	Alcohols: Nomenclature; Properties; Acidity and Basicity; Synthesis; Reduction-Oxidation Reactions; The Grignard Reaction; Synthetic Strategy	Ch 8
W- To F	04/24 To 05/03	Formation of Alkoxides; Substitution and Elimination (Dehydration) of Alcohols; Carbocation Rearrangements; Conversion of Hydroxyl Group to Good Leaving Groups; Ether Nomenclature; The Williamson Ether Synthesis; Acid-Catalyzed Ether Synthesis; Reactions of Ethers; Reactions of Epoxides; Sulfur Analogs	Ch 9 11-11  <b>Quiz 7</b>
		<b>Final Exam (Comprehensive)</b>	<b>Final Exam</b>