

SOUTHERN CONNECTICUT STATE UNIVERSITY

Course Number and Title **CHE 260 Organic Chemistry I**
Fall 2008

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Office Hours:
M: 4:10 PM - 5:00 PM
W: 10:00 AM - 12:00 PM
F: 10:00 AM - 12:00 PM

COURSE NUMBER 260 **CREDIT HOURS:** 4 **PREREQUISITES:** CHE120/121

COURSE TITLE: **Organic Chemistry I**

COURSE DESCRIPTION:

The course will focus on the basic principles of the chemistry of organic compounds as well as their detailed reaction mechanisms. In addition, these concepts will be applied through the laboratory portion of the course. The laboratory portion will also teach proper and safe techniques as well as emphasize the development of scientific writing skills on the basis of formal lab reports. Furthermore, the use of current organic instrumentation such as nuclear magnetic resonance spectroscopy, infrared spectroscopy, gas chromatography, mass spectrometry, and ultra violet spectroscopy will be a major focus of the laboratory component as well as the lecture component.

COURSE'S CONTRIBUTION:

This is the first of a two course sequence in organic chemistry that chemistry and pre-med students are required to take. The course will emphasize active understanding of the material and not just rote memorization. The other component of learning that will be emphasized is problem solving. Applications of certain concepts will be related to everyday uses.

LEARNER OUTCOMES & ASSESSMENT

- Learn how structure, bonding, and molecular properties apply to organic compounds. (NSTA 1, 5; INTASC 1)
- Learn how to acquire and interpret various types of spectra important to organic chemistry. These may include but are not limited to NMR (nuclear magnetic resonance spectroscopy), IR (infrared spectroscopy), and mass spectrometry. (INTASC 1, 4; NSTA 1, 3, 4, 5; CCCT 1.4, 2.6)
- Learn the concepts of conformational analysis and stereochemistry and their importance to the area of organic chemistry. Also, learn the proper use of a molecular model kit. (INTASC 3, 4; NSTA 1, 3, 4, 5; CCCT 1.2, 2.2, 2.5)
- Understand the chemistry and nomenclature of alkanes, alkenes, and alkynes. (NSTA 1; INTASC 1; CCCT 1.4)
- Learn the reactions of alkyl halides, specifically, nucleophilic substitution and elimination reactions. (NSTA 1; INTASC 1)
- Learn basic organic laboratory techniques such as recrystallization, melting points, extraction, distillation, and chromatography (NSTA 1, 3; INTASC 1; CCCT 1.4, 2.3, 2.5).
- Learn to apply the concepts learned in the lecture component of the course to the laboratory portion. (NSTA 1, 2, 3, 6, 9; INTASC 1; CCCT 1.3, 2.2, 2.4, 2.5, 3.6)
- Continue development of proper scientific writing style through the use of formal and informal laboratory reports. (NSTA 1, 2, 3, 4, 6, 8, 9, 10; CCCT 1.1, 1.3, 3.4)
- Learn safe laboratory practices in working with organic chemicals. (NSTA 9; CCCT 3.2)

MODES OF LEARNING

Lectures, demonstrations, assigned problems, in-class group assignments, and quizzes will be all used during the lecture component of the course. Furthermore, the laboratory experiments and hands-on instrumental use will serve

to reinforce concepts learned during the lecture. In addition, important techniques used by organic chemists will be learned along with safety issues. Students are expected to perform all of their experiments and receive a passing grade of > 60% in the laboratory component in order to pass the course.

COURSE CONTENT OUTLINE

1. Structure, Bonding and Molecular Properties of Organic compounds (6 lectures)

- Structure of atoms, atomic orbitals
- Chemical Bonding (ionic bonds, covalent bonds)
- Valence-bond theory (hybridization)
- Molecular Orbital (MO) theory (HOMO and LUMO)
- Resonance
- Electronegativity, dipole moments
- Acids and bases

2. Alkanes and Cycloalkanes (1 lectures)

- Alkanes as building blocks (isomers)
- Functional groups
- Nomenclature

3. MS spectrometry (1 lectures)

4. IR spectroscopy (1 lectures)

5. ^{13}C NMR (3 lectures)

- Theory of NMR
- ^{13}C NMR
- DEPT ^{13}C NMR

First exam: 10/1/08

6. ^1H NMR (3 lectures)

- Chemical Shift
- Integration
- Splitting

7. Conformational Analysis of Alkanes (1 lectures)

8. Conformational Analysis of Cycloalkanes (2 lectures)

9. Stereochemistry (4 lectures)

- Optical activity - enantiomers
- Diastereomers
- Meso compounds
- Racemic mixtures
- Stereochemistry of heteroatoms
- Prochirality

Second exam: 10/29/08

10. Organic Reaction Mechanisms (2 lectures)

- Radical reactions
- Addition reactions
- Displacement reactions
- Thermodynamics, kinetics, energy diagrams
- Intermediates, transition state, using curved arrows

11. Alkenes: Structure and Reactions (3 lectures)

- Cis-trans (E, Z) isomerism and degrees of unsaturation
- Hyperconjugation and regioselectivity (Markovnikov's rule)
- Hammond postulate
- Carbocations and their rearrangements

12. Alkenes: More reactions and their synthesis (3 lectures)

- Addition of halogens and water
- Reductions, hydroxylation and oxidative cleavage

13. Alkynes (3 lectures)

- Naming
- Synthesis
- Reactions

Third exam: 11/19/08

14. Alkyl Halides (2 lecture)

- Naming
- Radical halogenation (reactivity vs. selectivity)
- Allylic halogenation
- Reactions of alkyl halides

15. Alkyl Halides: Nucleophilic Substitutions and Eliminations (4 lectures)

- S_N1 and S_N2
- E1 and E2
- Effects of solvent, substrate structure, and nucleophile (base) on reactivity

Final comprehensive exam: 12/17/08 (as scheduled by the University)

REQUIRED TEXTS

- McMurray, J. *Organic Chemistry, 7th ed. with CengageNOW*, 2008, Brooks/Cole Publisher.
- Pavia, D. *Introduction to Organic Laboratory Techniques: a Microscale Approach*, 4th ed.
- Molecular Model Kit (two options available in the bookstore).
- Goggles (available from chemistry club).
- Hardcover Lab Notebook.

COURSE REQUIREMENTS

Exams:

The exams will be taken during regular class time. Students who arrive late will not be allotted extra time. Any changes will be announced in class. Only students with valid (documented) excuses will be permitted to take a make-up exam or quiz. Conflicts in scheduling should be resolved in advance (at least one week before the exam). All exams will be comprehensive written tests, but they will concentrate on the material covered since the previous test. They will be constructed in such a way as to emphasize active understanding of the material. Books, scratch paper (other than furnished), cell phones (and similar electric devices), and calculators will not be allowed. The use of a molecular model kit is limited to only one carbon with four bonds during examination.

Attendance:

Lecture attendance is strongly recommended. Laboratory attendance is mandatory.

Academic Integrity:

All forms of academic dishonesty will not be tolerated. Such infractions are considered cause, at the least, for awarding a **grade of "0"** on the assignment or exam in question. For more details, see the student handbook on the

subject. This policy will be *strictly* enforced.

Assigned Problems:

1. Structure, Bonding and Molecular Properties

Chapter 1: 18, 20, 22, 24, 25, 28, 30, 31, 33, 37, 40, 41, 42, 46, 48, 49, 50, 51, 53, 54. Chapter 2: 25, 26, 27, 29, 31, 32, 33, 34, 37, 38, 39, 40, 41, 43, 45, 48, 49, 53, 54, 56, 58.

2. Alkanes and Cycloalkanes

Chapter 3: 19, 21, 24, 25, 27, 28, 29, 30, 31, 34, 38, 41. Chapter 4: 21, 25, 26.

3. MS spectrometry

Chapter 12: 13, 17, 18, 20, 21, 22, 24.

4. IR spectroscopy

Chapter 12: 12, 27, 30, 31, 33, 34, 38, 41, 42.

5. ¹³C NMR

Chapter 13: 33, 34, 56, 59, 60, 61, 62, 63, 64.

6. ¹H NMR

Chapter 13: 31, 36, 37, 38, 39, 40, 41, 42, 44, 48, 49, 51, 52, 53, 54, 55, 57, 58.

7. Conformational Analysis of Alkanes

Chapter 3: 42, 43, 46, 47, 51.

8. Conformational Analysis of Cycloalkanes

Chapter 4: 22, 24, 27, 28, 29, 32, 33, 34, 37, 42, 43, 44, 48, 53.

9. Stereochemistry

Chapter 9: 31, 35, 36, 37, 39, 43, 44, 45, 46, 50, 53, 55, 63, 64, 65, 72, 78, 79.

10. Organic Reaction Mechanisms

Chapter 5: 20, 21, 24, 26, 27, 29, 30, 31, 32, 36.

11. Alkenes: Structure and Reactions

Chapter 6: 23, 24, 26, 27, 29, 31, 33, 35, 39, 40, 43, 48, 49, 52, 58.

12. Alkenes: More reactions and their synthesis

Chapter 7: 24, 25, 26, 27, 28, 29, 30, 31, 33, 36, 39, 41, 42, 43, 45, 49, 51, 52, 57. Chapter 9: 59, 60, 61, 62, 67, 68, 69.

13. Alkynes

Chapter 8: 18, 19, 20, 21, 22, 23, 24, 25, 26, 28, 29, 31, 33, 35, 41, 46.

14. Alkyl Halides

Chapter 10: 17, 18, 19, 22, 23, 25, 27, 31, 33, 35, 37, 39, 42.

15. Alkyl Halides: Nucleophilic Substitutions and Eliminations

Chapter 11: 25, 26, 27, 29, 30, 31, 34, 35, 36, 37, 38, 41, 42, 43, 47, 49, 51, 57, 61, 62, 65, 67.

EVALUATION CRITERIA

The course grade is based on the following criteria:

- Assigned problems, quizzes, class participation, 8%
- Three mid-term exams, 14% each
- Comprehensive final exam, 25%.
- Laboratory grade, 25%. All projects must be completed and a passing grade ($\geq 60\%$) must be received in

the laboratory component of the course in order to receive a passing grade in the course!!!

The course grade will be based on the grading scale below with possible adjustments at the instructor's discretion:

A+ (100-96)	B+ (85-82)	C+ (73-70)	D+ (61-58)	F <50
A (95-91)	B (81-78)	C (69-66)	D (57-54)	
A- (90-86)	B- (77-74)	C- (65-62)	D- (53-50)	

The instructor reserves the right to adjust the grading scales for class average at the end of the semester.

STANDARDS GUIDELINES

INTASC [Interstate New Teachers' Assessment & Support Consortium]	Professional Standards National Science Teacher's Association	CCCT {CONNECTICUT COMMON CORE OF TEACHING}
<p>Scholarship</p> <ol style="list-style-type: none"> 1. Knowledge of subject matter 2. Knowledge of human development & learning 3. Instruction adapted to meet diverse learners 4. Use of multiple instructional strategies & resources 	<ol style="list-style-type: none"> 1. Content - Structure and interpret the concepts, ideas and relationships in science 2. Nature of Science - Define the values, beliefs and assumptions inherent to the creation of scientific knowledge within the scientific community 3. Inquiry - Formulating solvable problems, constructing knowledge from data, exchanging information for seeking solutions, developing relationships from empirical data 4. Context of Science - Relate science to daily life: technological, personal, social and cultural values. 5. Skills of Teaching - Science teaching actions, strategies and methodologies, interaction with students, effective organization and use of technology. 6. Curriculum - Extended framework of goals, plans, materials and resources for instruction. 7. Social Context - Social and community support network, relationship of science to needs and values of the community, involvement of people in the teaching of science. 8. Assessment - Alignment of goals, instruction and outcomes, evaluation of student learning. 9. Environment for Learning - Physical spaces for learning, psychological and social environment, safety in science instruction. 	<p>DEMONSTRATIONS OF KNOWLEDGE</p> <ol style="list-style-type: none"> 1.1 understanding of student learning & development 1.2 understanding of need for different learning approaches 1.3 proficiency in reading, writing and mathematics 1.4 understanding of central concepts & skills, tools of inquiry and structures of discipline(s) 1.5 knowledge of how to design and deliver instruction 1.6 recognition of need to vary instructional methods
<p>Attitudes and Disposition</p> <ol style="list-style-type: none"> 5. Effective learning environment created 6. Effective communication 7. Lesson planning 		<p>APPLICATION OF KNOWLEDGE THROUGH</p> <ol style="list-style-type: none"> 2.1 instructional planning based upon knowledge of subject, students, curriculum & community 2.2 selection and/or creation of learning tasks that make subject meaningful for students 2.3 establishment and maintenance of appropriate behavior standards and creation of positive learning environment 2.4 creation of instructional opportunities supporting students' academic, social and personal development 2.5 use of verbal, nonverbal and media communication fostering individual and collaborative inquiry 2.6 employment of various instructional strategies in support of critical thinking, problem solving and skills demonstration 2.7 use of various assessment techniques to evaluate student learning & modify instruction
<p>Integrity</p> <ol style="list-style-type: none"> 9. Reflection and professional development 		
<p>Leadership</p> <ol style="list-style-type: none"> 8. Assessment of student learning to improve teaching 		
<p>Service</p> <ol style="list-style-type: none"> 10. Partnership with school and community 		<p>DEMONSTRATION OF PROFESSIONAL RESPONSIBILITY THROUGH:</p> <ol style="list-style-type: none"> 3.1 professional conduct in accordance

	<p>10. Professional Practice - Knowledge and participation in the professional community, ethical behavior, high quality of science instruction, working with new colleagues as they enter the profession.</p>	<p>with the Code of Professional Responsibilities for Teachers 3.2 shared responsibility for student achievement and well-being 3.3 continuous self-evaluation regarding choices & actions on students and school community 3.4 commitment to professional growth 3.5 leadership in the school community 3.6 demonstrations of a commitment to students and a passion for improving the profession</p>
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TENTATIVE COURSE CALENDAR
See "Course Content Outline" above.

DISABILITY ACCOMMODATION STATEMENT
I believe in providing reasonable accommodations for students with documented disabilities on an individualized and flexible basis. If you are a student with a documented disability, the university's Disability Resource Center (DRC) determines appropriate accommodations through consultation with the student. Before you may receive accommodations in this class, you will need to make an appointment with the Disability Resource Center, located in EN C-105A. To speak with me about other concerns, such as medical emergencies or arrangements in case the building must be evacuated, please make an appointment as soon as possible.

ADDITIONAL RESOURCES
It is strongly recommended that student routinely log-on to CengageNOW at <http://www.cengage.com/sso/> and work on the problems provided. Register by clicking first on create my account, then register as a student, then enter the access code that comes with your textbook, then provide the required information, and finally choose SCSU as your institution. The "section key" is E-3EEQRGWW8G8Q5. These assignments will not be graded, but will provide another resource for doing well in the course.