

CHEM 3313, ORGANIC CHEMISTRY I

Fall Semester, 2014

Chemistry Department, Dr. Treacy Woods, Department Chair

COURSE DESCRIPTION

This is the first lecture course in organic chemistry for science majors. It begins a survey of the structure, reactivity, reactions, reaction mechanisms, and synthesis of compounds containing carbon.

COURSE SEQUENCE IN CURRICULUM

CHEM 3313 is the first lecture course in the traditional two course sophomore/junior organic chemistry lecture sequence. It is required for Chemistry majors. It satisfies prerequisite requirements in many health professions programs.

PRE-REQUISITE INFORMATION

CHEM 2416 (General Chemistry II).

INSTRUCTOR INFORMATION

Name: Dr. Treacy Woods
E-mail: twoods@hbu.edu
Office Phone: 281-649-3247
Office Location: S210A
Office Hours: 10:00-11:00 AM Monday, Wednesday, Friday 2:00 to 3:00 PM Thursday
Web Page Address, Web Board, ListServ: The professor will post grades on Blackboard.

LEARNING RESOURCES

Course Text: Carey, Francis A. and Giuliano, Robert M., Organic Chemistry, 9th ed., McGraw Hill, New York, 2014.
Laboratory Text: None
Supplementary Text: Solutions Manual to accompany Organic Chemistry, 9th ed., McGraw Hill, New York, 2014.
The Solutions Manual to accompany the Carey text has answers to the problems in the text. The Solutions Manual is a nice resource to keep for study for exams such as the MCAT. These books are expensive. However, they are used for two courses, both CHEM 3313 and CHEM 3333. Since Fall, 2008 semester, they have been for the spectroscopy portion of the HBU organic laboratory courses. Keep your Carey textbook until after you have completed the separate CHEM 3131, 3132 organic laboratory courses.
Other Required Materials: None

COURSE OBJECTIVES

Purpose of the course:

Organic Chemistry I is a study of the fundamental molecules, theories, and principles of organic chemistry. Students, after completing the course, should understand the structure of organic molecules and how the more common organic reactions take place. They should be able to write reaction mechanisms and construct workable syntheses for simple organic molecules.

Aims for the course:

1. To name structures using various systems with emphasis on the IUPAC format.
2. To draw structures of compounds illustrating concepts from the topics of covalent bonding (hybrid orbitals, molecular orbitals, Lewis structures, VSEPR) conformations, and stereochemistry.
3. To write complete reaction mechanisms for the organic reactions studied in class.
4. To synthesize larger organic compounds from smaller ones utilizing reactions covered in class.

On completion of this course, students should be able to:

1. Write structures from names or provide names from structures.
2. Draw ring structures and conformations.
3. Draw tetrahedral carbon atoms illustrating important stereochemical details.
4. Complete organic chemical reactions by providing missing reagents or products.
5. Write reaction mechanisms for reactions studied in class given the reactants and products.
6. Construct a multi-step synthesis scheme for a larger organic molecule from smaller ones using reactions covered in class.
7. Answer essay questions on a variety of topics including acidity and basicity.

RELATION TO DEPARTMENTAL GOALS AND PURPOSES

The chemistry department prepares students to respond to their call to share in the wise stewardship of the matter that makes up all of creation in their chosen career. The chemistry department provides a program for students that gives them:

“A thorough and practical knowledge of the intricate nature of matter;”

“The ability to explore and discover the depths of the beauty of matter;”

“The ability to analyze problems, formulate solutions to problems, and be creative in response to challenges related to the wise use of matter;”

“The ability to respect the matter in creation through preparation for excellent and ethical practice of chemistry in their chosen career.”

“The opportunity to complete a major that is comparable in curriculum to those at institutions with chemistry majors certified by the American Chemical Society (ACS.)”

RELATION TO COLLEGE GOALS AND PURPOSES

“...to prepare students for careers and further education in the natural sciences and mathematics in a nurturing Christian environment. The College will also serve the HBU community by providing science and mathematics classes that empower HBU students to meet the goals and requirements of their field of study and enrich their liberal arts education.”

RELATION TO THE PURPOSE STATEMENT OF THE UNIVERSITY

University mission and purpose statement from the Houston Baptist University Catalog, 2009-2010: “...to provide a learning experience that instills in students a passion for academic, spiritual, and professional excellence as a result of our central confession, “Jesus Christ is Lord”

“...Committed to providing a responsible and intellectually stimulating environment that:

- fosters spiritual maturity, strength of character, and moral virtue as the foundation for successful living
- develops professional behaviors and personal characteristics for life-long learning and service to God and to the community
- meets the changing needs of the community and society
- remains faithful to the **‘Nature of the Institution’** statement”

“...Promotes learning, scholarship, creative endeavor, and service”.

ATTENDANCE

Please see the official Attendance Policy in the HBU Classroom Policy on Blackboard. Students missing more than 25% of the class will be given a failing grade.

In CHEM 3313, a roll sheet will be circulated during each lecture. Be sure to sign it. Failure to sign the roll will result in the student being marked as absent.

ACADEMIC ACCOMODATIONS

Students needing learning accommodations should inform the professor immediately and consult the Academic Accommodations section of the HBU Classroom Policy posted on Blackboard.

COURSE REQUIREMENTS & GRADE SCALE

Course requirements:

1. To attend all classes and take complete and careful notes.
2. To read and understand assignments in the text which complement and supplement material received in class.
3. To work problems assigned from the text. To check answers with those provided in the solutions manual.
4. To take all scheduled exams.

Exam Dates

Thursday, September 24	Exam One
Thursday, October 23	Exam Two
Thursday, November 13	Exam Three
Tuesday, November 25	Exam Four
TBA	Final Exam

Grading standards:

To obtain a grade of C, the student must be able to do the following:

1. be able to write short essay answers demonstrating a basic understanding of the concepts and principles presented in lecture. This will usually involve using the concept or principle in a situation different in form, but related in nature, to those presented in class.
2. when given reactants and products, demonstrate a basic proficiency in writing the correct mechanism.
3. to demonstrate a basic proficiency in devising synthetic routes for the preparation of a wide variety of complex molecules.
4. be able to provide names from structures and structures from names.

5. be able to draw structures that portray concepts of bonding and stereochemistry accurately.

Grading: There will be four exams and a final exam. The lowest score from exams one through four will be dropped. If a student misses an exam, a score of zero will be awarded. Advance permission of the professor is required in order for a score of zero from a missed exam to be dropped. The score on the final exam *may not* be dropped. The course grade is the average of the scores on the final exam and the best three lecture exams.

The grading scale is as follows:

90-100 A; 80-90 B; 70-79 C; 60-69 D; <60 F

PROFICIENCIES:

Technology component:

The professor will refer students to websites that feature animations of reaction mechanisms, conformations, and other related course material.

Designated essay/writing component:

All exams are essay in style. Students draw chemical structures, write reaction mechanisms, and devise syntheses in appropriate sequences.

Reading component:

A textbook is used.

Oral communication component:

Not applicable.

Mathematics component:

Not applicable.

Critical thinking component:

The critical thinking chemists use in problem solving is featured in this course. An example is the thinking involved in illustrating how electrons flow as reactants become products in drawings of reaction mechanisms.

LATE WORK & TEST POLICY

Late work:

Not applicable.

Missed tests:

Ordinarily, when a student misses an exam a grade of zero is given unless the student has permission from the professor to take a make up exam. If a catastrophe (death in the family, car accident, serious illness) prevents you from taking an exam, notify Dr. Woods *immediately (the day of the exam)* to discuss your situation. Documentation of the reason for the absence may be required for permission to take a make-up exam. If Dr. Woods cannot be reached by phone, leave a message on my voice mail or send an

email. Ordinarily, a student meriting a make up exam will only be permitted to take one make up exam per quarter. It is expected that students will take the make up exam within a few days of the missed exam.

EVALUATION

Method of student appraisal of faculty:

Students will be given an opportunity to appraise the professor by completing the IDEA Faculty Evaluation Questionnaire, and/or the COSM course evaluation at the end of the semester. The instructor, the department chairman and dean will review the responses of the students after the completion of the course.

Method of evaluating student response to course:

Students will be given an opportunity to describe their response to the course by completing the IDEA Faculty Evaluation Questionnaire and/or the COSM course Evaluation at the end of the course. The instructor, the department chairman and dean will review the responses of the students after the completion of the course.

LABORATORY DRESS CODE

Students may be asked in advance to wear closed-toed shoes and long pants during certain experimental procedures.

LABORATORY CONDUCT AND SAFETY

IMPORTANT INFORMATION FOR THIS COURSE: IF A STUDENT IS PREGNANT OR NURSING, SHE WILL NOT BE ALLOWED TO ATTEND THE LABORATORY SESSIONS BECAUSE SOME OF THE CHEMICALS, WHICH ARE NORMALLY INNOCUOUS, USED IN THESE LABORATORY EXPERIMENTS, MAY BE HARMFUL TO A DEVELOPING FETUS. IF A STUDENT BECOMES PREGNANT DURING THE COURSE, SHE MUST STOP ATTENDING THE LABORATORY SESSIONS IMMEDIATELY AND SHE IS TO NOTIFY HER PROFESSOR. THE PROFESSOR WILL DISCUSS OPTIONS THAT THE STUDENT WILL HAVE TO ENABLE HER TO COMPLETE THE COURSE REQUIREMENTS.

TOPICAL OUTLINE - *include table, calendar, or topical outline with dates*

Lecture:

Day	Date	Lecture topics	Reading from Carey 9 th edition	Homework from Carey 9 th edition
1	8-26	Syllabus. Chapter 1 Wohler, Elements in Organic Compounds, Electronegativity (EN), Covalent Bonds, Formal Charge, Lewis Structures, VSEPR	1.1, 1.2, 1.3, 1.4, 1.6, 1.10 Table 1.7 is nice.	1.1, 1.2, 1.3, 1.4, 1.5, 1.6, 1.7, 1.19, 1.20
2	8-28	VSEPR, Polarity of Organic Molecules	1.5, 1.11	1.8, 1.9, 1.21, 1.50, 1.51, 1.52
3	9-2	Hybridization, Covalent bonding, Molecular Orbitals	2.2; 2.3; 2.4; 2.6; 2.8, 2.9, 2.10	2.1, 2.2, 2.3, 2.4, 2.43, 2.47, 2.48

Day	Date	Lecture topics	Reading from Carey 9 th edition	Homework from Carey 9 th edition
4	9-4	Resonance, More formal charge, Intramolecular Forces Review, Bond data	1.6; 1.7; 1.8; 1.9; 1.12; 2.20	1.10, 1.11, 1.12, 1.13, 1.14, 1.15, 1.16, 1.17, 1.18, 1.22, 1.23, 1.24, 1.40, 1.41, 1.43, 1.45, 1.67, 1.68, 1.69, 1.70, 1.71
5	9-9	Chapter 2 Hydrocarbons Intro, Ways to draw structures, Degree of Unsaturation, Alkyl groups, Naming alkanes and alkyl groups.	1.7, 2.1; 2.5; 2.7, 2.11, 2.12, 2.13, 2.14, 2.15, 2.16, 2.17	2.5, 2.6, 2.7, 2.8, 2.9, 2.12, 2.22, 2.24, 2.29
6	9-11	Continued. Boiling points of alkanes. Heats of Combustion. Definitions of oxidation and reduction.	2.19, 2.20, 2.21, 2.22	2.14, 2.15, 2.16, 2.18, 2.37, 2.40, 2.45, 2.46
7	9-16	Chapter 3 Conformations and Newman Projections for ethane and butane	3.1, 3.2, 3.3	3.1, 3.2, 3.3, 3.4, 3.20, 3.21, 3.22, 3.23, 3.24
8	9-18	Cycloalkanes (rings) <i>Optional.</i> For extra enrichment, Read section 3.14 on polycyclics and look also at problems 3.41 and 3.42	2.18; 3.4, 3.5, 3.6, 3.7, 3.8, 3.9, 3.10, 3.11, 3.12, 3.13	2.13, 2.30, 3.8, 3.9, 3.11, 3.12, 3.13, 3.27, 3.29, 3.40
9	9-23	Chapter 4. Functional groups. Naming of alcohols and alkyl halides, classes of alcohols and alkyl halides, bonding	4.1, 4.2, 4.3, 4.4, 4.5	4.2, 4.3, 4.4, 4.5, 4.36, 4.37
10	9-25	Exam One: Chapters 1 and 2		
11	9-30	Physical properties of alkanes, alkyl halides and alcohols. Acids, K_a , pK_a , strength of acids, comparison of strong acids, alcohols reacting with strong acids.	4.6; 4.7; 1.13, 1.14, 1.15, 1.16	1.25, 1.26, 1.27, 1.28, 1.29, 1.30, 1.31, 1.32, 1.33, 1.34, 1.35, 1.39, 4.7, 4.8, 4.24, 4.25
12	10-2	Mechanism. S_N1 , S_N1 energy diagram. Carbocations.	4.8, 4.9, 4.10	4.9
13	10-7	S_N2	4.11, 4.12	4.15, 4.40 abcd, 4.41, 4.43
14	10-9	Bond Dissociation Energy, Free Radical Halogenation of Alkanes	4.13, 4.14, 4.15, 4.16	4.45, 4.46
15	10-14	Continued. Radical Selectivity.	4.17	4.21, 4.23, 4.40 e, 4.49
16	10-16	Chapter 5 Alkenes. Names. Cahn Ingold Prelog Sequence Rules, Alkene stability. Table 5.1 is nice.	5.1, 5.2, 5.3, .5.4, 5.5, 5.6	5.1, 5.3, 5.5, 5.6, 5.7, 5.8, 5.9, 5.12, 5.13, 5.29
17	10-21	Alcohol dehydration. Fates of carbocations. Carbocation rearrangements. Strong Bases. $E2$ Elimination.	5.7, 5.8, 5.9, 5.10, 5.11, 5.12, 5.13, 5.14, 5.15, 5.16	5.16, 5.17, 5.18, 5.19, 5.20, 5.21, 5.22, 5.26, 5.37, 5.38, 5.41, 5.47
18	10-23	Exam Two: Chapters 3 and 4		
19	10-28	Continued. $E1$ Elimination. Chapter 6 Catalytic Hydrogenation of alkenes, Electrophilic Addition to alkenes	5.18; 6.1, 6.2, 6.3, 6.4, 6.5	6.1, 6.3, 6.4, 6.5

Day	Date	Lecture topics	Reading from Carey 9 th edition	Homework from Carey 9 th edition
20	10-30	Continued	6.6, 6.7, 6.8, 6.9, 6.10, 6.11, 6.12, 6.13, 6.14, 6.15, 6.16	6.7, 6.14, 6.17, 6.20, 6.22, 6.24, 6.34, 6.35, 6.36, 6.39
21	11-4	Chapter 7 chirality, achirality, absolute configuration, R, S, Fischer Projections	7.1, 7.2, 7.3, 7.5, 7.6, 7.7	7.1, 7.2, 7.3, 7.4, 7.7, 7.8, 7.9, 7.10, 7.11, 7.33, 7.35, 7.36
22	11-6	Complex R,S cases, R and S when C* is in a ring, physical properties of enantiomers, optical activity, two C* case	7.4; 7.8; 7.11, 7.12	7.5, 7.12, 7.18, 7.19, 7.22, 7.23, 7.34, 7.38
23	11-11	Continued. Resolution. Optical Purity	7.4; 7.9; 7.10, 7.13, 7.14, 7.15	7.15, 7.17, 7.24, 7.25, 7.26, 7.28, 7.29, 7.30
24	11-13	Exam Three: Chapters 5 and 6		
25	11-18	Chapter 8 SN2 and SN1	8.1, 8.2, 8.3, 8.4, 8.5	8.1, 8.2, 8.3, 8.4, 8.5, 8.6, 8.7, 8.8
26	11-20	Continued	8.6, 8.7, 8.8, 8.9, 8.10, 8.11, 8.12	8.9, 8.11, 8.15, 8.16, 8.17, 8.18, 8.19, 8.20, 8.21, 8.23, 8.33, 8.34, 8.49, 8.50, 8.52
27	11-25	Exam Four: Chapter 7		
28	11-27	Thanksgiving: No Class		
29	12-2	Chapter 9 Alkynes	9.1, 9.2, 9.3, 9.4, 9.5, 9.6, 9.7, 9.8, 9.9, 9.10, 9.11, 9.12, 9.13, 9.14, 9.15	9.1, 9.4, 9.5, 9.9, 9.10, 9.11, 9.14, 9.15, 9.17, 9.18, 9.25, 9.26, 9.29
30	12-4	Chapter 10 Allylic Systems and Dienes, Diels Alder reaction	10.1, 10.2, 10.3, 10.4, 10.5, 10.6, 10.7, 10.10, 10.11, 10.12, 10.13	10.1, 10.2, 10.5, 10.9, 10.11, 10.23, 10.49
	TBA	Final Exam Chapters 8, 9, and 10		

Advice: Success in the course is facilitated when the student attends class everyday and takes their own good lecture notes. It is also aided when the student practices using the material before taking exams. Practice can be obtained by working problems in the text. Recommended homework problems from the text are listed above. Homework problems will not be turned in or graded. Complete answers to the homework problems are available in the Solutions Manual written by the authors of the text.

Work that is not returned to students (e.g. the final exam) can be viewed in the office of Dr. Woods for one semester after the completion of the course.

Audio-taping of lectures for your private use is permitted.

Help for students: See Dr. Woods in her office, if you have questions.

The content of this outline and the attached schedule are subject to change at the discretion of the professor.

Student Signature – I have read and understand the syllabus for this class. I understand that the content of this syllabus and the topical outline are subject to change at the discretion of the professor. I have read and understand the HBU Classroom Policy posted on Black Board. **I promise to uphold the Code of Academic Integrity at Houston Baptist University and will not tolerate its violation by others.**