

LEWIS & CLARK COLLEGE
Department of Chemistry
Chemistry 210 Course Outline
Fall 2011 - Dr. Louis Kuo

Lecture: Mon. Wed. Fri. - 10:20 a.m. **Miller 105**

Conferences: Mon (12:40 & 1:50 in **Olin 102**) Tues (9:40 in **Miller 104**)

Organic Chemistry is the study of carbon compounds. The three key concepts that will be introduced in this course are **structure**, **mechanism** and **reactivity** of carbon-containing molecules. Organic chemistry is very different from General chemistry in that carbon chemistry is more qualitative. The following topics from General chemistry are of special importance, and it is encouraged that you review these concepts.

- 1) The general outline of the Periodic Table, the progression of various chemical properties when descending or crossing the Table such as electronegativity, electron configuration, atomic size and the character of the chemical bonds formed.
- 2) The physical consequences (m.p., b.p., solubility) of ionic and covalent bonding.
- 3) The terminology and symbols used to describe the distribution of electrons in atoms and molecules. The shapes of atomic orbitals. Valence bond and molecular orbital description of bonding (single, double, triple, and ionic), and non-bonding electrons. The calculation of formal charges in all structures. The shape and symmetry of hybrid orbitals. ***Resonance and resonance hybrid.***
- 4) The chemistry of acids and bases. The definition of Lewis and Lowry-Bronsted acid/bases.
- 5) The thermodynamics of physical and chemical processes; Le Chatelier's Principle; the relationship between Gibbs free energy and equilibrium constants.
- 6) The kinetics of physical and chemical processes; activation energy and the use of energy diagrams.

General Organization

The regular lectures are scheduled on MWF 10:20 a.m. in Miller 105, all conferences will be held in Olin 102 and Miller 104 (Tues 9:40 a.m.), and **all laboratories in Olin 116.**

The lectures are intended as a guide to the major topics in the course. The conference periods will be used to discover new principles in light of old ones with all students working problems on the board; **attendance is required.** Please do not hesitate to arrange for individual conferences with your instructor.

Source Material

There are two textbooks that serve as a GUIDE for this course. One is "Introduction to Organic Chemistry," by A. Streitwieser, C. Heathcock, and E.M. Kosower, and the other is "Organic Chemistry" by Thomas Sorrell. In addition, prior students have found the plastic molecular modeling kits to be very helpful for this course. These model sets are pretty small and relatively inexpensive, so you may want to get your own. In addition, prior Chem 210 students may be willing to sell their sets to you.

The instructor will also provide some printed material summarizing key concepts of the lecture. You are asked to have a folder that will file these handouts as well as hold your returned homework assignments and exams.

Grading

Three one-hour exams (closed book/notes)	39%
Homework	16%
Lab	25%
Final	20%

Note from Student Support Services

If you have a disability that may impact your academic performance, you may request accommodations by submitting documentation to the Student Support Services Office in the Albany Quadrangle (x7156). After you have submitted documentation and filled out paperwork there for the current semester requesting accommodations, staff in that office will notify me of the accommodations for which you are eligible.

Office Hours

To Be Arranged

If I am not in my office (Olin 216), I will be in my research lab in Olin 118 or Olin 121.

Office extension 7535

E-mail: kuo@lclark.edu

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Chemistry 210

Approximate **Lecture Schedule**, Fall 2011

Concept	Lecture Topic	Reading Assignment		
		Streitwieser & Heathcock	Sorrell 2nd Ed	Sorrell 1st Ed.
S	Introduction to Lewis Structures	2.1 & 2.2	2.1 to 2.4	Chp 3
S	Lewis Structures II. Atomic Orbitals	2.3, 2.4 & 2.5	2.5a	Chp 3
S	Molecular Orbitals-Hybridization and Bonding	2.6 to 3.1	2.5b	pg. 85-90
S	Bonding and Structure for Alkanes and Alkenes	3.2 to 3.8 and 11.1 to 11.4	2.5c & d	pg. 91-100 & 104-109
S	Conformational Analysis of Alkanes	5.1 to 5.3	3.1	pp. 123-131
S	Conformational Analysis of Cycloalkanes	5.4 to 5.6	3.2	pp. 131-149
S	Conformational Analysis of Cycloalkanes II	7.7	3.3	pp. 131-149
S	Stereoisomerism I	7.1 to 7.3	4.1 & 4.2	pp. 165-189
S	Stereoisomerism II	7.4 to 7.6	4.3 & 4.4	pp. 165-189
<u>Exam #1 In Class, one-hour</u>				
S	Nuclear Magnetic Resonance I	13.1 to 13.4	13.1 to 13.4	Chp 15
S	Nuclear Magnetic Resonance II	13.6 & 13.8	13.1 to 13.4	Chp 15
S	Nuclear Magnetic Resonance III	13.9, 13.10, 13.12	13.1 to 13.4 & 13.13	Chp 15
M	Equilibrium and Kinetics	4.1 to 4.5	5.1a, 5.2a&b, 5.4	pp. 219-227, 241-246
M	Alkane Halogenation	6.1 to 6.3 & 7.8	12.1a to 12.1d, 12.3a	pp. 465-472
M	Nucleophilic Substitution I	9.1 to 9.2	5.3a to 5.3c, 6.1, 7.1a	pp. 263-301
M	Nucleophilic Substitution II	9.3 to 9.4 & 9.8	6.2	pp. 263-301
M	Nucleophilic Substitution III	9.5 & 9.6	6.3	pp. 263-301
<u>Exam #2 In Class, one-hour</u>				
M	Elimination Reactions I	9.7	8.1	pp. 325-342
M	Elimination/Rearrangement Reactions II	11.5	8.2, 8.3, 6.2d	pp. 325-342
R	Properties of Alcohols	10.1 to 10.4	5.2c	
R	Synthesis of Alcohols	10.5	7.1b&c	pp. 840-841
R	Activation of Alcohols	10.6	7.2a to 7.2e	pp. 296-301
R	Ethers	10.7 to 10.11	7.2a to 7.2e	pp. 304-305
<u>Exam #3 In Class, one-hour</u>				
R	Introduction to Organometallics	8.5 to 8.9	5.1 to 15.2e	pp. 577-589
R	Properties and Synthesis of Alkenes	11.5 & 11.6	9.1	
R	Electrophilic/Ionic Addition w/ Alkenes	11.6	9.4	pp. 369-391
R	Ionic and Radical Reactions w/ Alkenes	11.6	9.4	pp. 369-391
R	Oxidation of Alkenes	11.6	11.3a to 11.3c	pp. 440-448
R	Alkyne Synthesis and Properties	12.1 to 12.5	8.2e	pp. 345-346
R	Acid/Base Reactions of Alkynes	12.6	15.2f	pp. 589-591
R	Addition to Alkynes	12.6	9.2	pp. 393-397

Exam #4 In Class, one-hour

S=Shape/Structure

M=Mechanism

R=Reactivity

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Chemistry 210 Laboratory Schedule and Dates Fall 2011

Lab Lecture: Tues. Wed. Fri. – 12:40 OPC 102		Laboratory: OPC 116
<u>Week</u>	<u>Dates</u>	<u>Experiment(s)</u>
1	Aug 29, Sept. 1 & 2	Check in and general orientation including safety
2	Sept. 6, 8, 9	Melting Points (Expt 1; 10 pts) and Miscibility (Expt 2; 20 pts)
3	Sept. 13, 15, 16	Melting Points & Miscibility completed
4	Sept. 20, 22, 23	Distillation (Expt 3; 15 pts) <i>Lab reports for expt 1 and 2 due (Melting point & Miscibility)</i>
5	Sept. 27, 29, 30	Flash Column Chromatography* (Expt 4; 20 pts) Exam 1
6	NO LAB	FALL BREAK
7	Oct. 11, 13, 14	Flash Column Chrom. Completed and NMR analysis* (Expt 4). <i>Lab report for Expt 3 due (Distillation)</i>
8	Oct. 18, 20, 21	Nucleophilic Substitution* (Expt. 5; 30 pts) <i>Lab report for Expt 4 due (Flash Column Chromatography)</i>
9	Oct. 25, 27, 28	Nucleophilic Substitution completed* Exam 2
10	Nov. 1, 3, 4	Kinetics* (Expt. 6; 30 pts) <i>Lab report for Expt. 5 due (Nucleophilic Substitution)</i>
11	Nov. 8, 10, 11	Kinetics completed* (Expt 6)
12	Nov. 15, 17, 18	Dehydration lab* (Expt 7; 20 pts) Exam 3
13	NO LAB	THANKSGIVING Break <i>Lab report for Expt 6 due on Wed of Thanksgiving break (Kinetics)</i>
14	Nov. 29, Dec. 1, 2	Dehydration lab completed.*
15	NO LAB	Reading days <i>Lab report for Expt 7 due on Wed. of last week of class.</i>

* To be done in partners