

FALL 2013 CHEMISTRY 223-007 ORGANIC CHEMISTRY A

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Do you read the ingredient lists on food containers or the inserts included with prescription medicines? Do you have questions about 'natural' or 'organic' products? Do you worry about BPA formerly used in plastic water bottles and soup cans? If so, this could be the class for you! The **goal** of this class is to introduce you to the world of organic chemistry so that you can: 1) recognize organic compounds; 2) identify organic functional groups and understand their reactivity; 3) rationalize reactivity in poly functional compounds; & 4) apply this knowledge in future classes. With that background you should be able to read food labels; read science related news releases with some critical understanding; be prepared to interpret the structures and infer the reactivity of molecules to which you will be introduced; and, OH YES, pass exams in future classes that depend on this information. You might think of this as a new language that will provide a basis to understand future information by allowing you to build on the structural and mechanistic ideas here presented *e.g.* rationalize enzymatic reactivity or interpret drug interactions.

CONTENT: This course is a functional group approach to organic chemistry in which the fundamentals of aliphatic and alkenic chemistry will be discussed along with bonding, nomenclature, stereochemistry, conformational analysis, reaction mechanisms, and spectroscopy. The tentative lecture and exam sequence is listed in the schedule. I plan to cover 14.5 chapters in roughly 13.6 weeks with about 50 pages of reading per week. The first two chapters are a review of topics from General Chemistry. Your previous textbook may help you review this material. The class, especially the final exam is, of necessity, cumulative. The best plan is-study organic every day.

I will be available for questions after lectures, during the discussion sections (Tue 8:30-9:45 & 2:30-3:45), during posted OFFICE HOURS (MWF 10:20 am), and other times, usually by appointment.

LECTURE: M W F 9:20-10:10am, FH-133 **DISCUSSIONS** Tu 8:30 to 9:45, DH-125 & Tu 2:30-3:45 DH-227

GRADING:	3 exams	300 pts	54.5 %
	1 final	150 pts	27.3 %
	Group Homework	100 pts	18.2 % (i.e. 10 pts for 10 best chapt)

TEXTBOOKS and MATERIALS:

REQUIRED: ORGANIC CHEMISTRY, L.G. Wade Jr., 8th Ed., Prentice Hall (2012) You may also use the 6th or 7th Eds.
^ ISBN-13:978-0-321-76814-8 (Be certain you have the appropriate Study Guide.)

SUGGESTED:

STUDY GUIDE AND SOLUTIONS MANUAL, Wade & Simek 8th Ed or (6th or 7th Ed.)

MOLECULAR MODELS, Darling, Freeman (Maruzen), or Proteus .

Pushing Electrons: A Guide for students of Organic Chem. 3rd or 4th Ed, D.Weeks,

Organic Chemistry I as a Second Language: Translating the Basic Concepts 2nd Ed, D. Klein, J. Wiley (2008) OR

Organic Chemistry as a Second Language 1st Sem. Topics 3rd Ed John Wiley, Older copies are OK too.

PROBLEMS: You must work problems in a timely manner. Try to assess the relative difficulty and the topics covered so that you are working problems that accurately reflect the material covered in lecture. I will grade designated group homework and in class problems, but encourage you to complete and discuss all of the assigned homework. We can review homework in discussion section and during office hours.

EXAMINATIONS: Exam I-9/20, Exam II-10/16, Exam III-11/11, FINAL Saturday Dec 14, 2013 1 pm FH-133

NOTES:

1. Organic chemistry is not efficiently self-taught; overnight cramming *will not* produce consistent success. It is better to a) quickly scan the chapter before lecture so that your lecture comprehension is improved. After lecture, b) carefully read the chapter or portion covered in lecture, and then c) work the assigned problems. Your learning style may be relevant to the order.
2. To stay current in class, homework problems must be done soon after you cover the material in lecture. The night before an exam is not an appropriate time to start homework. Homework questions have appeared on exams.
3. I grade on a curve and will give statistics such as the mean, the median, and the standard deviation for each exam. I do not predict cutoffs, but can tell you what the cutoff was for a previous test or class. Makeup exams will not be given.
4. Study time/ week for a C should include: Lecture/disc 4hr, reading 4 hr, homework 1-2 hrs, organizing 1 hr. Total 10-11 hr/wk.
5. Copies of an old exam will be made available on Sakai about 1 week before the next exam.
6. Academic Integrity: If you are discovered to be cheating on an exam, a grade of 0 pts will be assigned for that exam, and the Dean of A&S will be informed. Other consequences may follow. The A&S website URL details Loyola Policies.
<http://www.luc.edu/media/luc.edu/cas/pdfs/academicintegrity.pdf>
7. All pagers and cell phones must be turned off during exams and all books, bags, coats, *etc.* brought to the front of the room!
8. LSC Tutoring Center (SUL-245 X83194) Free group tutoring and drop in Study Halls.www.luc.edu/tutoring are available starting the first week of class (Open 9am to 7 pm M-F).

SOME websites and magazines HAVE ARTICLES RELEVANT TO ORGANIC CHEMISTRY: *Discover*, *Scientific American*, *Consumer Reports*, *Science News*, *Science*, *etc.* Have you read articles about sweeteners, traces of drugs in city water, etc.?

DC

DATE	CHAP (Wade 8 th Ed)	223 Proposed LECTURE SYLLABUS LU FALL 2013
8/26	1	Intro: Lewis Structures, Bonding, bond polarity, charges, ionic strs., resonance, Molecular & Empirical formulas
8/28	1	Representations of molecules, models, Modeling, Acid-Base defs., Rel. Strengths(pg 1261), Nomenclature intro
8/30	2	MO Theory & bonding, hybridization -electron densities, Bond rotation, isomerism, Bond & molecular polarities
9/2		Labor Day - Holiday
9/4	2	Solubilities, intermolecular forces (VanderWaals) hydrocarbons, O & N containing cpds., funct. gps.
9/6	3	Alkanes-Nomenclature, properties, sources, reactions, bond rotations, and conformations
9/9	3	Cycloalkanes (as above + ring strain), Stereochemistry: definitions, isomers, & representations
9/11	3	Bicyclics, nomenclature, drawing, use of models,
9/13	4	Free radical halogenation, chain reactions, bond dissociation energies, K, ΔG , ΔH , ΔS
9/16	4	Kinetics, E_a or ΔG^\ddagger , kinetic rates (k) depend on T, [SM], and [catalysts], if needed. Hammond Postulate
9/18	4/5	Reactive intermediates. Chirality: definitions- R & S, racemic, ee, opt. purity, chiral cpds w/o chiral centers
9/20		EXAM I (Fri)
9/23	5	Representations (Fischer, models, etc), diastereomers, Multiple centers, Rev. Isomer defs., Resolution
9/25	6	Alkyl Halides: structure, nomenclature, properties, preps.
9/27	6	Halide Reactions: Substitution and Elimination, S_N2 reactions, mechanism- nucleophilicity, solvent, substrate
9/30	6	S_N1 reactions, mechanism, stereochemistry, structure, solvent, rearrangements, Comparison: S_N1 vs S_N2
10/2	6	Eliminations: E_1 (carbocation mech.) vs E_2 (concerted mech., stereochemistry)
10/4	7	Alkenes: MO description, index of H deficiencies, Nomenclature, isomers, stabilities, and properties
10/5-8		Midterm Break
10/9	7	Alkenes: Synthesis - Eliminations & dehydrations Industrial syntheses. Mechanistic (Problem solving strategies)
10/11	8	Alkene Reactions: Addition Reactions (HX , H_3O^+ , BH_3 -THF, H_2 /cat, halogen, HOX, carbene, epoxidation)
10/14	8	Alkene Reactions: epoxy opening, oxidative cleavage, syn-hydroxylation, polymerization, methathesis Probs.
10/16		EXAM II (Wed)
10/18	9	Alkynes: Nomenclature, Props, MOs, acidity, syntheses via substitution & elimination
10/21	9	Alkyne Reactions: Additions, oxidations, and multistep syntheses using alkynes
10/23	9	Alkene & Alkyne: Comparisons Reaction summary: Multistep Syntheses
10/25	10	Alcohols: Structure, nomenclature, classification, commercial importance, properties, acidity (phenols)
10/28	10	Syntheses: previous and addition of organometallic reagents to C=O cmpds.
10/30	10	Reductions of C=O cpds, Thiols (RSH): nomenclature, analogies to and differences from ROH.
11/1	11	Alcohol Reactions: oxidations, nucleophiles with acid halides (RSO_2Cl , HOCl, $SOCl_2$, PCl_3 , etc.) Drop Day
11/4	11	Alcohol Rxns: dehydrations, esterification with RCO_2H , inorganic esters (Spring Registration Begins)
11/6	11	Reactions of alkoxides & General Synthetic Approaches (Problem Solving)
11/8	12	Spectroscopy: Introduction and Infrared Spectroscopy (IR): Vibrations & Functional Groups
11/11		EXAM III (Mon)
11/13	12	Mass Spectrometry (MS): Mol Wt & Breakdown patterns
11/15	13	Proton Nuclear Magnetic Resonance: NMR& MRI Intro., Chemical Shift- ρ - densities, Integration
11/18	13	PMR (Proton NMR) Splitting patterns or Proton Coupling. Intro. to interpretation.
11/20	13	CMR (Carbon NMR): Chemical shift effects, carbon counting. Intro to interpretation
11/22	15	Ultraviolet (UV)/Visible (VIS) Spectroscopy: Conjugation and functional groups. Indicated Sects(13-15)
11/25		Solving Spectroscopic Problems using all 5 spectroscopic tools
11/27-12/1		Thanksgiving Break
12/2	14	Ethers: Nomenclature, properties, spectroscopy, syntheses (Williamson, from ROH, etc.)
12/4	14	Ether Reactions: Cleavage by HX, autoxidation. Sulfides [RSR']
12/6	14	Epoxides: Syntheses and Reactions (Acid cat., Base cat., RM Openings), epoxy resins
12/12?		Afternoon Review session could be available, if desired.
12/14 Sat.		FINAL EXAM 1-3 pm FH-133

SUGGESTED HOMEWORK FROM "ORGANIC CHEMISTRY" by Wade, L. G. (8th Edition)
 (The more problems you work, the better you should understand the topic.)

CHAP	PROBLEMS	Gp. Homework	Chap Problems	Gp. Homework
1.	1-11, 14-32, 34-38, 40-52	Hmwrk <u>45</u>	8. 1- <u>50</u> , 51-62	50
2.	All except #12.	Hmwrk <u>44</u> .	9. 1- <u>34</u> , 35-39.	34
3.	1-44,	Hmwrk. <u>44</u> .	10. 1- <u>40</u> , 41-44,	40
4.	<u>All except</u> 5,6,16,17,20, & after 49	Hmwrk. <u>46</u> .	11. 1- <u>50</u> , 51-60.	50
5.	1-11, 14-31,	Hmwrk. <u>30</u> .	12. 2-12, 14- <u>25</u> , 26- 29.	25
6.	1- <u>56</u> , 60 & 61	Hmwrk. <u>56</u>	13. 2-44, 46- <u>52</u> , 53.	52
7.	1- <u>46</u> ,	Hmwork <u>46</u>	14. 1-19, 21- <u>33</u> , 34-41.	33