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CHEMISTRY 302 Organic Chemistry I

David R. Myers, Ph.D.

Fall, 2009

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Class Webpage: www.simons-rock.edu/~myersd/orgo1.html

Office Hours: M 2:00-3:30, W 1:00-3:00; or by appointment.

Class: MW 8:30-9:55 a.m., F202, Recitation/Problem Session: F 9:00-9:55 a.m.

Laboratory: T 9:00-11:55 a.m., F128

Course Description: This course is designed to develop the theoretical and practical aspects of the chemistry of carbon compounds. Topics include bonding, classification of functional groups, organic chemical nomenclature, electron delocalization, stereochemistry, beginning of reaction mechanisms, and simple chemical syntheses. The course will run under the "lecture-less" format developed at Princeton University; under this format, the student has the greater responsibility for staying current with the material. Class time will be devoted to problem solving to illustrate the how and why of organic chemistry, plus, as necessary, some lecture on the more esoteric and/or difficult topics. The laboratory experiments will primarily address the skills and techniques of organic chemistry labs, including synthesis, separations, and extractions; some experiments will demonstrate lecture topics. Experiments will be performed either micro- or semi-micro scale.

Course Objectives: To provide the beginning of a solid basis in organic chemistry, and prepare the student for the second semester of organic chemistry. The student should develop an ease with the subject, and be able to read and understand parts of the chemical literature. The techniques learned in the laboratory are important, as they will be used in the second semester also, and, should the student enter chemistry as either a graduate student or a profession, throughout the rest of the career.

Course Requirements: 1) **Attendance:** In theory, there are no "allowed" cuts (compliance with the college policy on observation of religious holidays excepted) in either the lecture or the laboratory. Reality dictates that some will occur; therefore 3 unexcused absences from lecture, 1 from laboratory will be permitted without penalty. It is understood that all missed work will be made up. Make-up exams will be given at the instructor's convenience during reading period.

2) **Grading:** There will be four (4) exams in this course, three (3) of which will be given during the semester, and one (1) given as a cumulative final. The final should not scare you; chemistry is a cumulative subject/science, and attempting to give a non-cumulative final is ridiculous, particularly in a course such as Organic, in which **every** chapter draws, in some way, upon those chapters which have preceded it. These exams will count as 70% of your final grade. (Hourlies: 16% each; final: 22%) The laboratory will count as 30%. **Note that you must pass the laboratory to pass the class, regardless of the**

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numbers. Quizzes (non-counting) **may** be given as needed; usually (but not exclusively) on nomenclature. There will also be non-counting (for now) problem sets given after every chapter. These will be reviewed at a weekly recitation session, which will be scheduled by consensus.

3) **Texts:** "Organic Chemistry", M. Jones, Jr.; (3rd. Ed.); "Introduction to Organic Laboratory Techniques: A Microscale Approach", Pavia, Lampman, Kriz, Engel. (4th Ed.) These are the required texts for the course. There is also a required notebook for the laboratory, available from the bookstore. A recommended text for mechanisms practice is: "Pushing Electrons: A Guide for Students of Organic Chemistry", D. Weeks. A set of molecular models, available by special order, is strongly recommended. More about these during the introduction.

Tentative Course Outline:

Date	Book Reference	Brief Description
8/31	§1.1-1.4	Atoms, Molecules, Orbitals
9/2	§1.5-1.7	Bonding, Reactivities
9/4	§1.8 §2.1-2.2	Quantum (Orgo-style) Hybrid Orbitals, Methane
9/7	§2.3-2.8	Methyl Compounds & Intermediates, Ethane, Newman Projections, Propane, Butane, Conformational Analysis
9/9	§2.9-2.14	Pentanes, Nomenclature, Isomers, Rings, Physical Properties, NMR
9/11		Problems/Recitation
9/14	§2.15-2.16 §3.1-3.3	Acids and Bases Revisited Alkenes, Derivatives
9/16	§3.4-3.8	Nomenclature, Cahn-Ingold-Prelog System; Stabilities, Rings, Physical Properties
9/18		Problems/Recitation
9/21	§3.9-3.14	Alkynes, Relative Stabilities, Isomers, Rings Physical Properties, Acidity of Alkynes
9/23	§3.15-3.19	Degrees of Unsaturation Addition Reactions Electronegativity, Mechanism of the Addition

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		of HX, Regiochemistry
9/25		Problems/Recitation
9/28	§3.20-3.22 §4.1-4.2	Catalyzed Reactions, Synthesis, Alkenes & Biology Chirality
9/30	§4.3-4.7	Chirality, Enantiomers, (R/S) Convention, Physical Basis, Properties of Enantiomers, Mobile Equilibrium.
10/2		Problems/Recitation
10/5	§4.8-4.14	Diastereomers & Physical Properties, Absolute Configuration, Rings & Chirality, Summary of Isomerism, Chirality without Four Different Groups, Stereochemistry in the Real World (Exam I)
10/7	§5.1-5.3	Rings and Strain, Quantitative Measurement
10/9		Problems/Recitation
10/12-10/16		FALL BREAK!!
10/19	§5.4-5.9	Cyclohexane, Mono & Disubstitution, Bicyclic Compounds, Polycyclic Compounds, Adamantanes
10/21	§6.1-6.4	Preview of Alkyl Halides Alkyl Halides, Organometallics, Alcohols
10/23		Problems/Recitation
10/26	§6.5-6.9	Solvents, Diols or Glycols, Amines, Ethers Thiols & Thioethers
10/28	§6.10-6.11 §7.1-7.3	Crown Ethers, Alkaloids Lewis Acids/Bases, Substitution Reaction
10/30		Problems/Recitation
11/2	§7.4-7.9	Substitution Nucleophilic Bimolecular (S _N 2) S _N 2 in Biochemistry, S _N 1 Reaction, Overview of S _N Reactions, Elimination Reactions (E ₁ , E ₂)

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11/4	§7.10 §8.1-8.4	Organic Synthesis Equilibrium, Gibbs Free Energy, Rates (Exam II)
11/6		Problems/Recitation
11/9	§8.5-8.9	Rate Constants, Transition States and Activation Energies, Reaction Mechanisms, Hammond Postulate, Enzymes & Reaction Rates
11/11	No Class—Diversity Day	Activities
11/13		Problems/Recitation
11/16	§9.1-9.6	Addition of HX to Alkenes, Regiochemistry, Resonance, Resonance and Carbocations
11/18	§9.7-9.13	Inductive Effects, Hydration, Dimerization and Polymerization, Rearrangements, Hydroboration, Alcohol Formation, Rearrangement in Biology
11/20		Problems/Recitation
11/23-11/27		THANKSGIVING RECESS!!
11/30	§10.1-10.5	Addition of X ₂ , Oxymercuration, Oxiranes and Cyclopropanes, Ozonolysis
12/2	§10.6-10.10	Addition to Alkynes, Hydration of Alkynes, Hydroboration & Hydrogenation Of Alkynes
12/4		Problems/Recitation
12/7	§10.11-10.12 §11.1-11.2	Anti-reduction of Alkynes, Three-membered Rings in Biology (Exam III) Formation of Radicals
12/9	§11.3-11.7	Structure & Stability of Radicals, Addition to Alkenes
12/11		Problems/Recitation
12/14	§11.8-11.11	Photohalogenation, Allylic Halogenation, Rearrangements (and non-rearrangements) of Radicals

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12/16		Review (or Catch-up day)
12/18, 12/21-22	Exam Week	FINAL EXAM