ORGANIC CHEMISTRY (CH 203 L and CH 203 D) COURSE OUTLINE

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Office hours: Tuesday (11-1 PM) and Thursday (11-1 PM) in room 127 (Chemieneubau). Please come at the beginning of the hour.

Fall
CH203 - lecture and laboratory (4 credits)

Location and Meeting Times

Lecture CH 203 L, Chemieneubau, room 153, twice a week for 90 minutes
Discussion CH 203 D, Chemieneubau, room 153, once a week for 60 minutes
Note well: The lectures and the discussions will not be repeated.

Lecture Textbooks and Other Course Material.: Organic Chemistry 6th Edition, by John McMurry (Brooks Cole), Solutions Manual by Susan McMurry, and Pushing Electrons, by Daniel Weeks (Saunders) - this book is recommended but not required. Molecular Models especially those that have "space filling" hydrogen atoms are useful.

Examinations: **(There are no "make-up" exams)** There will be three (3) 'in class' examinations during the semester and a final examination. The examination rooms will be announced prior to the examinations. **You may drop one of the "in class" examinations for any reason** but you may not drop the final examination. Each examination (including the final examination) is worth 100 points.

Examinations will be held during the scheduled discussion sessions

(There are no "make-up" exams - don't ask for one)

If the median grade of an examination is less than 75, the median grade will be raised to a 75 by adding a constant amount to the grade of each student. If the median grade is greater than 75, the grades will not be changed. The lowest 10% of the grades on an examination will not be used to calculate the median grade.

Final Grades: The final grades for those students taking both the lecture and laboratory portions of the course (CH203) will be based on 400 points (300 points for examinations and 100 points for the laboratory).

Incompletes: Incomplete grades will be given if and only if you have not taken the final examination but you have taken all the other required exams, or if the laboratory portion of the course is incomplete. You must be in good standing academically in the course. You must fill out an incomplete form. **If you do not fill out this form, a grade of F will be recorded.** In order to discharge an incomplete grade, you make up the incomplete work only. This work must be finished within one calendar year. **You do not take the course over.**

Grade Changes: Except for incomplete grades, a course grade cannot be changed after six months.

Workload: You must plan to spend 4-5 hours per lecture hour (**12-15 hours per week**) studying organic chemistry and working on the homework problems. (To encourage you do as many homework problems as possible, the material on the quizzes and examinations will be taken occasionally from the questions in the text.) This is in addition to work associated with the laboratory.

If you need extra help: If you need extra help in organic chemistry it is suggested that you ask questions before, after or during lectures, attend discussion and ask lots of questions, attend Professor Rüger's or Professor Habicher`s office hours, and/or the office hours of the lab leader.

Rules for Taking Examinations, Cheating and Academic Misconduct. We attempt to conduct our examinations in a manner that discourages cheating. Cheating is self destructive, disrespectful to your faculty and terribly unfair to your classmates. Accordingly, we have rules that govern the administration of our examinations.

You are permitted to bring to the examination

1) Molecular Models as long as they are contained in a **colorless and transparent** plastic bag. No paper is permitted in the bag. Nothing can be etched on the models.

2) Beverages in a colorless and transparent bottle.

You are not permitted to bring to the examination

1) Any notes or other resources

2) Calculators or any other electronic or optical device.

3) No wrapped food

During the examination, you must be seated orderly in every other row.

All personal possessions are to be placed at the front of the room.

Hats with visors are to be turned backwards.

There is no talking to other students or sharing of any materials such as molecular models.

If you need to go to the restroom **you must be accompanied by a teaching fellow**.

You may not start the exam late if a student has turned in his/her examination and left the exam room. If you are late you will not be given additional time to take the test.

All other common rules of exam taking are enforced.

Any infraction is **immediately** reported to University officials who then takes further action.

Helpful Hints:

1) Keep up on the material.
2) Review and rewrite your lecture notes after every lecture.
3) Form study groups (maximum of four students).
4) Find problems at the end of the chapter that correspond to the lecture material.
5) Don't cram for exams
6) Use the practice exams to see if you are prepared for the real exam.

CH203 Reading Assignments --McMurry

Do the appropriate 'in text' problems as you read the text. I have assigned a number of 'end of chapter' problems.

The Basics: **Chapter 1** (Skip sections 1.6). Most of this material is a review of general chemistry. Some of the material will be dealt with in the first tutorial session. **Do problems in Chapter 1 (21-27, 29,31, 32, 38, 44, 46, 47); Weeks** -- Do the problems in chapter 1 on Lewis structures

1) Inert gas rule
2) Lewis dot bond line diagrams
3) Ionic and covalent bonding
4) Hybridization and bonding
5) π and σ bonding

Nomenclature: **Chapters 3**) Do the problems on the handouts. Use the nomenclature system that I present in class. Much of this material is scattered through the textbook.

1) Priority and non priority groups
2) Generic and trivial names
3) Hydrocarbyl substituents and the IUPAC naming of alkanes. Bond line representations.
4) Cycloalkanes
5) Alkene and Benzene
6) Alkynes

7) Other non-priority groups (halides, nitro compounds, nitroso compounds, ethers, thioethers, azides, sulfoxides, sulfones).
8) Priority groups (sulfonic acids, carboxylic acids, esters, amides, nitriles, aldehydes, ketones, alcohols, thiols and amines

Stereochemistry Chapters 3.8, 4, 6.5-6.7, and 9. Do problems in Chapter 4 (24-26, 29, 31-36, 39, 41-43, 53, 55) Chapter 6 (26, 29, 33, 35, 41, 42, 44,) Chapter 9 (31, 32, 33, 36, 37, 38, 39, 41, 43, 44, 45, 46, 50, 53, 55, 57, 63, 64, 70, 73, 82, 83). Handout problems.
1) Types of isomers
2) Cis/trans isomerism in cycloalkanes and alkenes
3) Cahn Ingold Prelog rules
3) Angle strain, torsional and steric strain
4) Conformational analysis of ethane, propane, butane, and cyclohexane
5) Symmetry
6) R/S convention
7) enantiomers and diastereomers
8) meso compounds
9) optical rotation/optical purity
10) Fischer projections
11) resolution
12) enantiotopic diastereotopic/homotopic hydrogens
13) N, P, S stereogenic centers
14) Conformational isomers

Electronic Structure: Chapter 2, 1-2.6, 15.3, 15.5-15.9, class notes Do the following problems: Chapter 2: 29-32, 35-38, 56; handouts.
1) Inductive effects
2) Delocalization of pi electrons
3) Resonance and resonance structures
4) Aromaticity

Weeks - Read chapter on drawing resonance structures**.**

Infrared Spectroscopy

McMurry - Chapter 12, 12.5-12.9
1) Brief introduction to mass spectrometry.
2) Infrared spectroscopy., schematic of the IR spectrometer, vibration energy levels, number of normal modes of vibration, different types of vibrations, IR active vibrations, Hooks law, reduced mass, bond energies
3) Interpreting infrared spectra

Do the following problems at the end of the chapter: 34, 35, 36, 39, 41, 43

Nuclear Magnetic Resonance Spectroscopy

McMurry - Chapter 13.1-13.3, 13.8-13.13
1) Magnetic energy states
2) Chemical shifts

3) Number of signal and integrations of signals
4) Spin-spin splitting and coupling constants - Karplus curve
5) Time dependence, equilibrating structure, hydrogen bonding.
6) Deuterium
7) Generation of NMR spectra
8) Interpreting NMR spectra.
9) Degree of unsaturation
10) Structure identification using IR, and NMR spectroscopy.

Do the following problems at the end of the chapter: 28, 29, 31, 36, 37, 38, 39, 43, 44, 46, 50,51, 52, 53, 54

The Proton Transfer Reaction. Chapters 2, 8.8, 17.3 and class notes. Do the following problems in Chapter 2: 43, 45, 47, 48-51, 55, 59.
Factors that influence acidity (bond energies, electronegativity and inductive effects, resonance effects and aromaticity, steric inhibition of resonance, solvation and hydrogen bonding.

Dynamics and Thermodynamics: Chapter 5
1) The concept of mechanism.
2) Factors that control the rate of reaction.
3) The reaction coordinate diagram.
4) Transition states and the Hammond postulate
5) Multistep reactions and the rate limiting step.
6) Rates equations and thermodynamic considerations
Do the problems at the end of the chapter.

Electrophilic Addition Reactions and Other Reactions of the C-C Double Bond and Triple Bond: Chapters 6.7-6.12; 7.1-7.9, 8.1-8.7, 17.7 Do problems in Chapter 6 (39, 40, 47-50); Chapter 7 (23-29, 35-42, 54). Chapter 8 (24, 25, 29, 30, 31, 33, 38)
1) Electrophilic addition reactions (carbocation stability, regiochemistry, stereochemistry, Markovnikov's rule,)
2) Carbocation rearrangement, hydride shift, methyl shift, ring expansion
3) Addition of halogens and pseudo-halides -- competition between open carbocation with bromonium ion in addition of bromine to acenaphthalene
4) Addition of HX
5) Hydration
6) Addition of carbocations
7) Oxymercuration
8) Epoxidation, osmylation, dihydroxylation
9) Addition of HOX --Halohydrin formation,
10) 1,4 versus 1,2 -addition to conjugated dienes
11) Thermodynamic and Kinetic Control
12) Other reactions: Hydrogenation, Hydroboration, Cyclopropanation, Hydroxylation, Epoxidation.
13) Carbon-carbon bond cleaving reaction -ozonolysis, HIO_4

Do the problems at the end of the chapters.