Chemistry 208B - Organic Chemistry

Lecture: S-200, Thursday. 6:30-9:30 pm Lab: S-230, Tuesday 6:30-9:30 pm

Instructor: Paul Herrmann **Office Hours**: Mon, Wed. 11-11:30 am
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Required Materials:

Organic Chemistry, 7th, 6th, 5th, or 4th ed., by L.G. Wade
Organic Chemistry: Solutions Manual, 7th, 6th, 5th, or 4th ed., by J. Simek and L.G. Wade
Techniques in Organic Chemistry, 1st or 2nd ed. by Mohrig, Hammond, Shatz, and Morrill.
Hardbound Laboratory Notebook with numbered pages
Safety glasses with side shields (or goggles)
Calculator

Resources:

In computer lab S8: Beaker and ChemDraw programs (on the Mac only)
From storeroom: *Merck Index*, CRC *Handbook of Chemistry and Physics*, and the Aldrich catalog.

Computer labs (S-205 and S-261):

We have 2 computer labs which have useful software, including molecular modeling (Spartan), RasMol, and chemical visualization software. We will be using these labs during the semester, but you may also use them outside of class time. S-205 is staffed by students about 20 hours each week. The schedule is posted outside S-205. If the door is locked, I can let you in.

Homework:

You are responsible for all material covered in the lecture, laboratories, and in the reading assignments. Please read the assigned chapters according to the attached schedule. I strongly advise you to read the assigned chapters before attending the corresponding lecture. I have listed all of the assigned problems for the semester in this syllabus. These will not be collected and graded, but the questions and material covered in the exams and quizzes will **strongly** reflect the assigned problems. You may find some of the problems redundant, but I have listed all of the problems that pertain to the material you will be expected to know. As an additional incentive, some of the questions on the exams or final will come directly from the homework problems. **Reading** the chapter **does not** mean you understand the material. The **best** way to study is to **do all of the assigned problems**. In addition, you must read and prepare for each laboratory experiment **before** the scheduled period. This is for two reasons: 1) If you are prepared for the labs, the laboratory will be a much more safe environment for everyone, and 2) You will get much more out of the labs when you are doing them if you have thought about them previously.

Attendance:

Regular attendance is required for success in the course. If you miss more than two consecutive lectures or laboratories, you may be dropped from the course. **In general, if you know that you will have to miss a lecture or lab for a legitimate reason, come tell me. We can figure out how and when you can make up your absence**. If you drop or are dropped from the course, it is your responsibility to file an official withdrawal form. Failure to do so will result in a grade of "F" for the course. Missed exams and quizzes will result in zero points for that exam or quiz.

Grading:

There will be 3 exams (1 hour and 45 minutes, 100 points each) and a cumulative final exam (3.5 hours, 200 points). The laboratory will be worth 75 points (based on lab reports and a one hour lab final). There are no make-up exams. Failure to take the final exam on the assigned date will result in an "**F**". If there is an **excused** absence during an exam, a score equal to at least 90% of the average of your other exams will be assigned. Grades will be based on the percentage of points earned. This is a **very rough** scale, which will likely change during the term.

A	85 - 100 %
B	70 - 84.99 %
C	55 - 69.99 %
D	45 - 54.99 %
F	Below 45 %

Important Registration Dates:

Tuesday, February 2	Last day to officially withdraw, drop or reduce course work units in order to obtain an enrollment fee refund.
Friday, February 5	Last day to add credit classes or to change sections.
Friday, February 11	Last day to drop class with no "W" notation on your transcript.
Friday, April 23	Last day to drop class and receive a "W" notation on your transcript.

A few words about taking exams. Cheating is strictly forbidden and is the one thing I will **not tolerate.** When you cheat on an exam, you are cheating both yourself and everyone else in the class - and you are defeating the very purpose for which you are taking the course. More importantly, you will have to live with the knowledge that you cheated for the rest of your life (I was raised Catholic). If I observe anyone cheating during an exam or a quiz, I will take your exam, give you a zero for that exam, and will give you an **F** for the course. I am **extremely serious** about this.

Laboratory Notebooks and Reports:

You must have your laboratory notebook with you whenever you are carrying out any experimental work. All original data belongs in your notebook. Never write data on loose sheets of paper with the intention of transferring them to the notebook at some future time; you may lose the values along with the time spent obtaining them. In case of an error, cross out the incorrect figures with a single line so that they may still be read, and write the correction next to or above the original. Use permanent ink - **not pencils!** Lab reports will consist of the copies of your notebook for each experiment. Please use the following format.

Title and Date

Purpose: A brief statement of the objective of the experiment. **Also include the balanced reactions for the experiment.**

Physical constants: List all relevant constants for the compounds used. This usually includes molecular weight, b.p. and density for liquids, m.p. for solids. This also includes relevant data for reaction solvents (b.p. if you are heating the reaction), and **hazards such as toxicity and flammability**. **Also include amounts of the reagents used in your experiment and the theoretical yield of the product.**

Procedure: A detailed summary of the steps you will be performing during the experiment. This must be done **before** lab. You should be able to follow your summary without using the textbook or handout. It is convenient to write this summary in one column (about 2/3 of the width of the page) and leave a small column blank to record any changes in the standard procedure or observations of your reaction.

Results: List the results of your experiment **in a brief table**, including amounts (in grams and moles) of reagents used, **amount of product obtained, % yield of the product**, m.p. of the product (if it is a solid), b.p. of the product if it was obtained by a distillation, and relevant spectral data (list peaks and interpretations).

Conclusion/Discussion: A brief (about 1-3 pages) summary of the relevant information for the experiment. What do your results tell you? What was the mechanism of the reaction? What functional groups or structural features of the starting materials were important in determining the outcome of the reaction? What is the driving force of the reaction you performed? How pure are your products (using your m.p/b.p data and spectra)? Explain the results of any tests you performed on the product. Try to account for any problems such as poor yields or impure products. **Do not** mention typical laboratory difficulties such as: "Some solid was left behind in the flask because I couldn't scrape it all out." I will take points off for saying that!

Questions: Answer any assigned questions or problems.

Everything up to and including the procedure summary should be completed before beginning the experiment. If you do not have the procedure summary done before lab, you will have to leave lab and complete the summary before being allowed in laboratory.

Safety and Cleanliness: The best way to be safe in lab is to be prepared. Think about what you will be doing in lab before you begin. What glassware will you need? etc. You must wear safety glasses at all times and contacts will not be permitted. They are extremely hazardous, so wear glasses. Dispose of all wastes in the appropriate manner. Be sure that you mark the contents of your waste on the bottle label. Being safe and clean shows respect for your classmates, yourself, and for the people using the lab after you. This is your chance to make CCSF a more pleasant and humane place for the other students!

208B Spring 2010 Experiments:

Note: **All the experiments will be from handouts**. All of the reading assignments refer to *Techniques in Organic Chemistry*. Hopefully, all the techniques are still fresh! All of the labs are on **Tuesdays**.

Date	Experiment	Reading
Jan. 19	Check-in/NMR training	
Jan. 26	NMR/Aspirin Synthesis	Ch. 13
Feb. 2	NMR/Aspirin/Luminol	Ch. 13
Feb. 9	Nitration of Methyl Benzoate	Review microscale technique
Feb. 16	Nitration/Friedel Crafts Reaction	Ch. 1, 3
Feb. 23	Friedel Crafts Reaction	Ch. 1, 3
Mar. 2	Aldol Reaction	Review Recrystallizations
Mar. 9	Aldol Reaction	
Mar. 16	Dyeing	Wear dark clothing – bring a white t-shirt to dye
Mar. 23	Fisher Esterification	Review extractions and GC
Mar. 30	**SPRING BREAK**	**SPRING BREAK**
April 6	Fisher Esterification/Synthesis of Soap	Water is the enemy! – read Ch. 9 and dry glassware for Grignard Reaction
April 13	Grignard Reaction	Water is the enemy!
April 20	Grignard Reaction	
April 27	Investigation of a Mechanism	
May 4	Investigation/Diels-Alder Reaction	
May 11	Diels-Alder/Lab Final	Your Lab Reports
May 18	Check-Out	
May 25	OPEN LAB	

Tentative Lecture Schedule

Wed. Date	**Lecture Topics**	**Reading** (see problems)
Jan. 21	Hello!, Reactions of conjugated alkenes, biosynthesis of terpenes, polymers, kinetic vs. thermodynamic control	Ch. 15, Ch. 25 (section 25-8), Ch. 26 (section on synthetic rubbers)
Jan. 28	More on conjugation and aromatic compounds	Ch. 16
Feb. 4	Electrophilic Aromatic Substitution (EAS), Nucleophilic Aromatic Substitution, reduction and oxidaton reactions	Ch. 17
Feb. 11	More benzene chemistry and intro to aldehydes and ketones	Ch. 17, 18
Feb. 18	Aldehydes and Ketones, properties and nucleophilic attack by alcohols and amines.	Ch. 18
Feb. 25	**EXAM 1**, introduction to enolate chemistry	Ch. 22 (part 1)
Mar. 4	Enolate Reactions	Ch. 22 (part 1)
Mar. 11	Enolate Reactions, introduction to amines	Ch. 22 (part 1), Ch. 19
Mar. 18	Amines – basicity, Sandmeyer, Gabriel, and Hoffmann reactions. Reductive amination.	Ch. 19
Mar. 25	Carboxylic Acids -	Ch. 20
April 1	**SPRING BREAK**	**SPRING BREAK**
April. 8	**EXAM 2**, Carboxylic Acid derivatives	Ch. 21
April 15	Carboxylic Acid derivatives – relative reactivity and interconversion of acids, esters, anhydrides, and amides and nitriles	Ch. 21
April 22	More enolate chemistry – Michael reaction, Robinson Annulation, Claisen Condensation, Malonic ester synthesis	Ch. 22 (part 2)
April 29	Enolate Chemistry and Diels Alder Reaction	Ch. 22 (part 2), Ch. 15 (section 15-11)
May 6	Diels Alder and Carbohydrates	Ch. 23
May 13	**EXAM 3**, intro to Proteins	Ch. 24
May 20	Protein Synthesis and **REVIEW**	Ch. 15-24
May 27	**FINAL EXAM – Thursday 5/27 6:30-10:00**	