Chemistry 208A - Organic Chemistry

Lecture: S-204, Tuesday 6:30-9:30 pm

Lab: S-230, Thursday, 1-4 pm or Thurs. 6:30-9:30 pm

Instructor: Paul Herrmann, PhD.

Office Hours: T 5:30-6:15 pm

Office: Science 249

Note: I am on sabbatical this semester and will only be on campus on Tuesday evening.

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Required Materials:

Organic Chemistry, 6th (or 5th or 4th) ed., by L.G. Wade
Organic Chemistry: Solutions Manual, 6th (or 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. There are also links to useful websites for NMR practice and for getting safety data on compounds on my homepage.

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

We also have computer labs which have useful software, including molecular modeling (Spartan), RasMol, and chemical visualization software. We will be using this lab a couple of times during the semester. You may also use them outside of class time. If the door is locked, I can let you in as long as I am in school.

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 which 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 (1.75 hrs, 100 points each) and a cumulative final exam (3 hrs, 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 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	72 - 84.99 %
C	55 - 71.99 %
D	45 - 54.99 %
F	Below 45 %

Important Registration Dates:

Tuesday, September 2 - Last day to officially withdraw, drop or reduce course work units in order to obtain a 100% enrollment fee refund.

Friday, September 5 - Last day to add credit classes or to change sections.

Friday, September 12 - Last day to drop class with no "W" notation on your transcript.

Friday, November 14 - Last day to drop class and receive a "W" notation on your transcript.

Remember, if you do decide to drop the course, it is your responsibility to officially withdraw from the course! Don't assume that I will withdraw you from the course if you stop coming to class!

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: General Procedure – your lab instructor may have slightly different requirements. Follow your lab instructor's guidelines.

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. You **must** use the following format.

Title and Date One line, just with the title and date of the experiment

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: **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 summary of the relevant information for the experiment (about 1-3 pages, depending on writing size). **Explain the theory of how the technique or the reaction works**. What do your results tell you – do they mesh with the theory? 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 does the theory of the procedure/reaction determine the technique of the experiment? 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!

Experiments:

Note: **All the experiments will be from handouts**. All of the reading assignments refer to *Techniques in Organic Chemistry*.

Thursday.	Experiment	Reading
8/21	Check-in and Melting Points	Ch. 1, 2, and 3
8/28	Melting Points/Recrystallization	Ch. 9 and 10
9/4	Melting Points/Recrystallization	Same as above
9/11	Modeling/Chemically Active Extraction	Handout/Ch. 8
9/18	Modeling/Chemically Active Extraction	Handout/ Ch. 8
9/25	Chemically Active Extraction	Ch. 8
10/2	Distillation	Ch. 11
10/9	S_N1/S_N2 reactions	Handout
10/16	Competing Nucleophiles	Handout Ch. 16, review Ch. 8,11
10/23	Competing Nucleophiles	Handout
10/30	TLC of analgesics	Ch. 15
11/6	Column Chromatography	Ch. 17
11/13	Synthesis of alkenes	Review Ch. 8,11, 16
11/20	Synthesis of alkenes, IR/NMR	Ch. 18 and 19
11/27	THANKSGIVING HOLIDAY	
12/4	IR/NMR	Same as above
12/11	IR/NMR/check-out (day lab)	Same as above
12/18	Lab Final? and Check-out (night lab)	Your lab reports!

Tentative Lecture Schedule

Tuesday	**Lecture Topics**	**Reading** (Wade)
Aug. 19	Hello!, Lewis Structures, Resonance, Acid/Base	Ch. 1
Aug. 26	More on Resonance, hybridization, functional groups, intermolecular properties	Ch. 1, 2
Sep. 2	Nomenclature, Newman Projections, cycloalkanes, cyclohexane conformations	Ch. 3, Ch. 6 (6-2)
Sep. 9	Radical Halogenation, Bond strengths, Hammond Postulate, Hyperconjugation, ΔH calculations	Ch. 4
Sep. 16	Stereoisomerism, (R) and (S), Fischer projections, meso structures	Ch. 5
Sep. 23	**EXAM 1**, S_N2 and S_N1 reactions	Ch. 6
Sept. 30	S_N2, S_N1, E1, and E2 reactions	Ch. 6
Oct. 7	Ch. 6 continued	Ch. 6
Oct. 14	Alkenes, nomenclature, stability, and heat of hydrogenation	Ch. 7
Oct. 21	Alkene reactions: regio- and stereochemistry	Ch. 8, Ch. 26 (26-1 ‡ 26-2B)
Oct. 28	**EXAM 2**, Alkynes: nomenclature, reactions and synthesis of alkynes (similar to alkenes)	Ch. 9
Nov. 4	Alkynes continuted, nomenclature, properties, and synthesis of alcohols	Ch. 9, 10
Nov. 11	Reactions of alcohols, oxidation/reduction, inductive effect, Grignard reaction	Ch. 10, 11
Nov. 18	IR spectroscopy, NMR spectroscopy	Ch. 12, 13
Nov. 25	NMR spectroscopy	Ch. 13
Dec. 2	**EXAM 3**, synthesis and reactions of ethers	Ch. 14
Dec. 9	Epoxides, sulfur reactions, **REVIEW**	Ch 1–14
Dec. 16	**FINAL EXAM**	Ch. 1–14