Chemistry 125 Fall 2019, Advanced Organic Chemistry Lab

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Course Introduction: The emphasis of Chemistry 125 is the application of the tools of chemistry to the synthesis of organic molecules, the separation of mixtures of organic compounds, and the subsequent identification of these compounds. Chemistry 125 focuses on discovery-based learning, i.e. the concept that learning comes as you solve various organic chemistry puzzles. In this laboratory you will run several synthetic experiments, but you will not be provided with all of the details of the procedures (contrary to the approach in Chemistry 25). The products will be unknowns whose structures you will determine by the interpretation of infrared, NMR, and mass spectral data.

Each of the basic experiments will require a written report, formatted in the style of a paper in the Journal of the American Chemical Society (a realistic model for the senior thesis) or a PowerPoint presentation. In addition, there will be a final poster project with presentation. All reports must be done using a word processor. Spectra must be embedded in the body of the text close to the point of discussion. All structures must be drawn with ChemSketch, ChemDraw, ISIS Draw, or some other structure drawing program. No handwritten reports or additions to the reports will be accepted.

Textbooks for This Course: A reference textbook is a **very good** idea for Chemistry 125. Having said that, the books are very expensive, so consider these books as HIGHLY recommended. The first suggested book is *Laboratory Techniques in Organic Chemistry* by Mohrig, Alberg, Hofmeister, Schatz, and Hammond (ISBN-13 978-1-4641-3422-7). It contains a lot of background information on techniques learned in Chemistry 25 or your first semester organic laboratory. This book will provide you with a review and guide as to how to do some of the standard operations in the laboratory. If you have never performed a technique, thoroughly study the appropriate section in your old text and discuss it with the instructor. It also has information new to the Chem 125 material, in particular information on the more advanced spectroscopy techniques.

The second suggested text for this course is *Spectrometric Identification of Organic Compounds* by Silverstein, Webster, and Kiemle (ISBN 978-0-470-61637-6 for the 8th edition, but the 7th edition is fine as well**).** This is not a textbook, but more of a reference book with lots of data for comparisons. If you suspect that you a have a certain type or class of compounds, look in the index to find the sections on IR, NMR, and mass spectra for that family of compounds. In your reports give the reference to the page in Silverstein where your supporting assignment is found.

Items to Purchase for This Course

1. Strongly suggested (but not required) one of the two books mentioned above.
2. Bound laboratory notebook. You will be required to keep notes in this book and will turn it in to your instructor at the end of the semester. **The notebook must be with you at all times in the lab**. The rule is: "No Labbook, No Work in the Laboratory!"
3. Safety **Goggles** (**not** glasses). These are required for protection of your eyes. The rule is: "No Goggles, No Work in the Laboratory!"

4. Gloves (nitrile). Purchase nitrile gloves through the Bookstore or most local hardware or box stores. Be sure to get the correct size; a larger size is easier to get on and off. Gloves should always be worn when you are working with chemicals or chemically contaminated glassware. The rule for this class is: "No Gloves, No Work in the Laboratory!" This is for your protection. (Note: gloves should NOT be worn into the hallways or when typing on any keyboard on any instrument)

5. Lab Coat (long sleeves, knee length). The goal is to make sure no skin is exposed to chemicals, and that chemicals must travel through multiple layers to reach the skin. The rule for this class is: "No Lab Coat, No Work in the Laboratory!"

6. Chemistry 125 Laboratory Manual (bookstore) and Lecture Handouts (found on Canvas).

Attire. While working in the lab you must wear long pants (or a floor-length skirt) and shoes which completely cover the foot at all times in the lab. No skin should ever show (therefore skinny jeans which are tight around the ankles but do not go down to cover the ankles all the way to the shoe are not acceptable). Contacts are not recommended in the lab. These rules apply at ALL TIMES.

Lab Notebook You are to keep a bound lab notebook which will contain the following:

1. A table of contents
2. Numbered pages
3. Date of work as it is performed
4. Equation for reaction being performed
5. Pertinent physical constants of the organic starting materials and potential products: mp of solids and bp of liquids, molecular weights, densities, etc.
6. An outline of what you are planning to do.
7. Any potential hazards such as: fire, toxicity, NFPA numbers, etc. See Dangerous Properties of Industrial Materials edited by Sax for a listing of hazards of known compounds or check any Safety Data Sheet (SDS)-found in the service center or on-line**. It is recommended that safety information be accumulated in a separate section in your lab book for easy access at all times in all experiments**.
8. A record of what you actually did: Correct masses and moles of reactants, volumes of liquids, concentrations of solutions, actual procedure (not what the experimental procedure told you to do), observations of reaction process, clean-up procedures, data collected during reactions, mass of product (mp, bp, etc where appropriate), analyses performed
9. Summary of conclusions drawn from analyses and a clear identification of the product.

This information, along with the spectral and chromatographic (HPLC, TLC, etc) data, will be used in writing lab reports/presentations.

Experiments and Required Work

1. **Homework Sets.** In order to learn how to interpret and assign spectra to structural features in organic compounds several spectral problem homework sets will be assigned. In addition, there will be a homework set dealing with basic review and a homework set based on the correct use of the data analysis programs. All points for homework will be added together and scaled to 100 pts.

2. **Experiments.** A total of 4 experiments will be completed through the course of the semester. Each of the first three experiments will require either a formal written lab report or a PowerPoint presentation (see instructor). The final experiment will be presented in poster format (see below).

3. **Poster Project**. The culmination of this laboratory is the successful completion of an individual project which will be described in a poster that will be displayed in the joint poster session for Chemistry 125, 110, 141 and164, which is tentatively scheduled for Friday December 13, 2019 in the Alumni Center (more details to follow). **Attendance at the poster session is mandatory, and you must be present to discuss your project (you cannot simply set up the poster and leave)!** Project topics will be chosen in consultation with your instructor. You cannot pass the class without participating in the poster session. **DO NOT** plan to finish the semester early.

Approximate Point Distribution

	Points
Experiment 1	100
Experiment 2	100
Experiment 3	100
Poster Project	140
Technique / Lab book	60
Homework Problems	100
Total	600

Grading will follow the percentages of the total points earned:

100-90.0% A to A-
89.9-80.0% B+ to B-
79.9-70.0% C+ to C-
69.9-60.0% D
below 60% F

Extra information, due dates, and sample grading forms can be found on the Canvas website. Check this site frequently (particularly the calendar) for updates, class schedule changes, announcements, etc.

Cheating: Cheating in any form is not tolerated in this class. A student caught cheating will receive a zero on that assignment. If a student is caught a second time, the student will fail this course and will be sent before the University for disciplinary action. Cheating includes copying from another student's paper, using extra materials during testing, plagiarizing material in a report, altering exams after they have been graded, etc. Please refer to the University Policies on Academic Honesty if you have any questions. If you do not completely understand what is meant by the term "plagiarism", please talk to your High School counselor about the inadequacy of your training, then come to the instructor for a crash course in what is the difference between your work and someone else's.

Accommodations: Students with disabilities requiring special help or accommodations should see the instructor as soon as possible. Students should bring documentation from the Services to Students with Disabilities office here on campus (Lassen Hall 1008, 278-6955).