

Organic Chemistry Lab Section 01

CHEM 113B

Spring 2023 3 Unit(s) 01/25/2023 to 05/15/2023 Modified 01/21/2023

Contact Information

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Office Hours

Monday, Wednesday, 2:30 PM to 3:30 PM, SCI 166

or by appointment

Course Description and Requisites

Continuation of CHEM 113A including more advanced work.

Prerequisite: CHEM 113A (with a grade of "C" or better; "C-" not accepted). Chemistry majors only or instructor consent.

Pre/Corequisite: CHEM 112B.

Misc/Lab: Lecture 1 hour/lab 6 hours.

Letter Graded

* Classroom Protocols

CHEM 113B Uses a mixture of laboratory experiments, lectures, discussion, and 'flipped classroom' formats. Adequate preparation for both laboratory and lecture classes is essential for both safety and to ensure a successful learning experience. Collegial approaches are encouraged between students, and between student and faculty, so that learning is a joint endeavor.

Laboratory Sessions

Attendance of laboratory sessions (MW 1030-1320) is mandatory. Frequent absences from the lab will affect your progress in experiments and will likely have an effect on your final grade.

Details of the experimental procedures and techniques, along with required report formats, will be provided on Canvas.

A major requirement for success in Chem 113B labs is advanced preparation. This means you should read the experimental background and procedures carefully before the lab period. You will be given the starting material for each experiment only after the instructor checks both your preliminary writeup in your notebook, and the table of reagents and products. Your starting material will be provided to you in a vial, which you will swap for an empty vial.

Note that you MUST have your preliminary writeup and table of reagents and products completed BEFORE you will be given any starting material. Obviously, if you have to work on these items during the scheduled lab period, you will seriously deprive yourself of adequate bench time to complete the experiment. A less obvious benefit of advanced planning will be that you may be able to use time during long procedures (e.g. refluxing) to perform other aspects of the experiment to catch up or get ahead. The lab schedule is arranged so there should be adequate time to complete each experiment well within the allotted dates.

Laboratory Notebooks

The preliminary write-up of all notes and observations must be kept in a bound notebook with pre-numbered duplicate pages. All entries must be made in pen - NEVER erase or use 'white out'. Sometimes 'mistakes' turn out to be critical pieces of information! RECORD ALL OF YOUR NOTES AND OBSERVATIONS IN DIRECTLY IN YOUR NOTEBOOK, AS THEY OCCUR. Don't use scraps of paper; don't memorize measurements. The main point of the notebook is to be a journal of your laboratory activities so that you, or someone else, can read it at a later date and fully understand what you did, how you did it, and why things came out the way they did. It's OK to correct entries by drawing a line through them. The main point is that it is organized and understandable.

Scanned images of your notebook pages must be submitted with each laboratory report

Laboratory Equipment

You will be assigned an individual locker of equipment for your use during this course. You will be checked into your locker during the first lab period by the instructor, and sign an acknowledgment that you have all of your equipment. You are responsible for keeping track of all of the contents of your drawer. If you lose or break any item, you will be assessed a breakage fee at the end of the semester, so be careful with your equipment. It is possible to complete this course with a relatively small bill for expendable items: it is also possible to end up with a >\$100 bill! No one can help you if something is lost or broken, so be careful! When you check in, you will be given a coded check out pad from the storeroom. You may use this pad to check out additional equipment from the storeroom which may be required for a particular experiment. Note that certain equipment items checked out must be returned the same day to avoid a late fee. Remember, the code on your pad is assigned to you only, don't lose it, or someone else can use your code!

At the end of the semester, you must clean out your locker, replace all broken equipment or glassware, and have the instructor sign the check-out form. If this process is not completed fully, you may be charged a fee to clean and refurbish your locker.

Laboratory Safety

Before you will be allowed to work in the laboratory, all students in Chem 113B must:

1. Attend the safety lecture (first lab meeting)
2. View the Safety film.
3. Read the Safety Rules for Teaching Laboratories on the chemistry department website
4. Pass a short online quiz on laboratory safety (grade of 80% or above)

All of the above conditions are mandatory, and must be completed before you will be allowed to work in the lab!

In addition to the points covered above, these are especially worth emphasizing:

1. ALWAYS WEAR SAFETY GOGGLES IN THE LAB!!! (over your eyes, not on your forehead!)
2. Be aware that we will be using some flammable solvents, do not have any flames when you (or someone else in the room) are handling these
3. Similarly, treat all acids, bases, and reagents as potential hazards. Avoid skin contact with all of these, and treat any contact immediately. If you have a spill, never leave it unattended (let the instructor know).
4. Glassware breaks. Use caution in any experimental procedure, and exchange any chipped or cracked glassware Also, dispose of all glassware in the special bins, not in the trash cans!
5. The texts have sidebars or highlighted sections outlining special safety precautions - always enter these into your procedure section in your notebook (another reason to read ahead!)

6. You are absolutely required to follow any instructions provided by the instructor related to procedures and/or safety. Failure to do so will result in your immediate disenrollment from this class.
7. If you are not sure, ask!!

In addition, for safety reasons, before you start an experiment, you are expected to fully understand the procedures and hazards involved, and follow the instructors directions. Familiarize yourself with the safety rules for teaching labs on the chemistry department website. Note in particular: "Failure to comply with proper procedures and prescribed safety concerns shall subject the student to disciplinary action. 1) Any student who engages in unauthorized experimentation, or who seriously disregards safety, thereby endangering self or others shall be withdrawn immediately from the class with a grade of "F". 2) Any student who shows persistent disregard for safety may have his/her grade lowered, and may risk being withdrawn with a final grade of "F".

Special rules of safety and conduct apply when using the Bruker Fourier 300 NMR, the GCMS and other instruments. These will be provided by the instructor.

With preparation and organization, it will be possible to complete all of your lab work during the scheduled lab period. Except in unusual cases, no lab work will be permitted outside of the scheduled lab times. Usually, the only situation where this may be allowed is in cases of illness where more than a few periods are missed and for which you provide verification by your doctor. In any case, under NO circumstances are you to work outside of your appointed lab period without the written approval of the 113B instructor. Any student found working without expressed permission outside of the lab time may be disenrolled from the class!

Seminars

Attendance of the seminar period (W 13:30-14:20) is mandatory. Seminars may be a traditional lecture format or utilize a group problem solving format, or some combination of both. For both formats it is essential that you prepare adequately using the provided reading material and/or videos indicated on Canvas and in the class schedule

Five of the seminar periods will be used for quizzes covering various aspects of spectroscopy and characterization of organic molecules

Quizzes

Five of the Wednesday seminar sessions will be used for quizzes on various aspects of organic spectroscopy. Quizzes are open note/open book, but not 'open internet'. The quiz schedule and topics will be indicated on canvas and in the class schedule.

The four highest quiz scores will be counted toward the final grade

Final Exam

The final exam will be on Monday May 22 at 9:45 am

🎯 Course Goals

CHEM 113B is a continuation of 113A and includes more advanced techniques used in the synthesis, isolation purification and characterization of organic compounds. Emphasis is on the practical skills and knowledge required to execute multi-step syntheses and to design and/or adapt laboratory procedures rather than follow 'cook-book' procedures. Formal lab reports (following ACS/Journal of Organic Chemistry style) will emphasize writing and communication skills.

📊 Course Learning Outcomes (CLOs)

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- Mastering advanced laboratory techniques for manipulation of organic compounds (synthesis, separation, purification)
- Characterization of organic compounds by physical and spectroscopic methods including:
 - *Use of Infrared, 1D and 2D proton NMR and 13C NMR to characterize organic molecules*
 - *Apply mass spectroscopy (exact mass and fragmentation patterns) to organic structural analysis*
 - *Select conditions for GC analysis and analyze gas chromatographic data*
- Maintain useful contemporaneous notes of experimental procedures

- Write original formal laboratory reports in ACS journal style
- Locate scientific data as needed from paper and electronic sources as needed
- Design experimental procedures for new reactions and modify existing procedures as needed
- Operate safely in the laboratory and dispose of waste properly

Program Learning Outcomes (PLO)

Chemistry 113B satisfies the following Program Learning Outcomes for the Chemistry Department:

PLO 2.1 - Students will be able to develop an experiment to address a hypothesis using literature and execute the planned experiment using standard chemistry techniques.

PLO 2.2 - Students will be able to acquire, record, and critically evaluate data through use of instrumentation and software, appropriate record keeping practices, figure preparation, and scrutiny of experimental results.

PLO 2.3 - Students will be able to recognize and assess laboratory hazards, practice risk minimization, and conduct safe laboratory practices.

Course Materials

Note that exams are open book/note. Consequently electronic versions of texts are not acceptable since you may not use cell phones or laptops during exams

Spectrometric Identification of Organic Compounds

Author: Silverstein, R. M.; Webster, F. X.; Kiemle, D. J.

Edition: Any

Introduction to Spectroscopy,

Author: Pavia, D.L.; Lampman, G.M.; Kriz, G.S.

Edition: Any

Other equipment requirements

- Lab Notebook (that allows for duplicate pages) - a partly used lab notebook is acceptable.
- A set of molecular models.
- Pencils, Ruler, Calculator (Since you may not use cell phones or laptops on exams, you will need a calculator)

The ACS Style Guide

Publisher: American Chemical Society

Grading Information

Criteria

Type	Weight	Topic	Notes
Reports and Assignments	60 %		
Quizzes	20 %		
Final Exam	20 %		

University Policies

Per [University Policy S16-9](http://www.sjsu.edu/senate/docs/S16-9.pdf) (<http://www.sjsu.edu/senate/docs/S16-9.pdf>), relevant university policy concerning all courses, such as

student responsibilities, academic integrity, accommodations, dropping and adding, consent for recording of class, etc. and available student services (e.g. learning assistance, counseling, and other resources) are listed on [Syllabus Information web page](https://www.sjsu.edu/curriculum/courses/syllabus-info.php) (<https://www.sjsu.edu/curriculum/courses/syllabus-info.php>) (<https://www.sjsu.edu/curriculum/courses/syllabus-info.php>). Make sure to visit this page to review and be aware of these university policies and resources.

Course Schedule

The course schedule will be provided on canvas as a separate document