

San José State University
Chemistry Department
CHEM 113B, Organic Chemistry Lab (II), Section 01-02, Spring 2021

Course and Contact Information

Instructor:	Professor Chester Simocko
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Office Hours:	TR 10:30AM-12:00PM or by appointment
Class Days/Time:	Lab: MW 10:30 AM – 1:20 PM; Seminar: Asynchronous
Classroom:	Science 139
Prerequisites:	CHEM 113A (with a grade of "C" or better; "C-" not accepted).
Pre/Corequisite:	CHEM 112B

Course Web Page (Canvas)

Course materials such as syllabus, handouts, notes, assignment instructions, etc. can be found on the [Canvas](http://sjsu.instructure.com) learning management system course website at <http://sjsu.instructure.com>. You are responsible for regularly checking with the messaging system through Canvas to learn of any updates.

Course Description

Continuation of CHEM 113A including more advanced work.

Course Goals

The goal of the course is to achieve greater familiarity with advanced techniques in the synthesis, isolation, purification and characterization of organic compounds. The use of modern spectroscopic techniques for structural determination is also emphasized.

Course Learning Outcomes (CLO)

Upon successful completion of this course, students will be able to:

1. operate safely in the laboratory and dispose of waste properly.
2. maintain a proper laboratory notebook.
3. demonstrate mastery of advanced laboratory techniques for manipulation of organic compounds including synthesis and purification.
4. obtain and process data from NMR experiments.
5. characterize organic compounds by spectroscopic methods including
 - a. 1D and 2D NMR (^1H and ^{13}C nuclei).

- b. mass spectrometry (exact mass and fragmentation patterns).
6. rationalize regio- and stereoselectivity.
7. develop and analyze a testable hypothesis.
8. locate scientific data and sources from journals as needed.
9. write original formal laboratory reports in ACS journal style, including use of Chemdraw structures.

Program Learning Outcomes (PLO)

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

PLO #2 - Demonstrate understanding of core concepts, methods and limits of scientific investigation to effectively solve problems in organic chemistry.

PLO #6 - Answer questions regarding safe practices in the laboratory and chemical safety.

PLO #7 - Demonstrate safe laboratory skills (including proper handling of materials and chemical waste) for particular laboratory experiments.

PLO #10 - Write a formal scientific laboratory report which applies the scientific approach to address a chemical problem and follows the format and style of an article in a peer-reviewed American Chemical Society journal.

Required Texts/Readings

Note that quizzes and exams are open book. Electronic versions of the Silverstein and the Pavia texts are acceptable.

Textbook

Available at the Spartan Bookstore, or other book sellers such as Amazon:

1. Silverstein, R.M., Webster, F.X., Kiemle, D.J. *Spectrometric Identification of Organic Compounds*, 7th edition, 2005 (ISBN 0-471-39362-2) or 8th edition, 2014 (ISBN 978-0-470-61637-6).
2. Pavia, D.L., Lampman, G.M., Kriz, G.S., Vyvyan, J.R. *Introduction to Spectroscopy*, 4th edition, 2009 (ISBN 0495114782) or 5th edition, 2014 (ISBN 128546012X). Note - you will need the "full" edition, not the shortened SJSU version.

Available online:

1. [The ACS Style Guide](https://pubs.acs.org/isbn/9780841239999), found at <https://pubs.acs.org/isbn/9780841239999>.

Note – our section does **not** have Lab Notes for purchase at SAACS this semester. You will be provided with protocols on Canvas.

Other Readings

In CHEM 113B, you will be expected to have a working knowledge of the techniques that were covered in CHEM 113A. Please refer to the [CHEM 113A website](#) that Dr. Straus has created for information about the techniques found at <http://www.chemistry.sjsu.edu/straus/visioche.htm>.

Other technology requirements / equipment / material

Required equipment

-Scientific laboratory notebook with duplicate numbered pages - if you still have space in the notebook from 113A, you can continue using it; otherwise obtain a new notebook from the Chemistry Club (SAACS) or Bookstore.

-non-programmable calculator

-pencils, rulers

As the computer labs at SJSU will not be available, you are required to have a laptop/home computer available. There are several pieces of software that we use that you must have access to. I will provide the programs but you must have a computer to run them on. If you do not have access to a computer, they can be borrowed from SJSU for the entire semester. Here is a link for information on this program: <https://library.sjsu.edu/student-computing-services/student-computing-services>

Lab 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 acknowledgement 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 replacement 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 bill in excess of \$100. At the end of each lab period, make sure you have collected all your locker items before leaving.

When you check in, you will be given a coded check out pad from the storeroom. 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 check out items which will be charged to you.

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. If you drop the class or do not complete CHEM 113B, you must checkout by the last lab meeting to avoid this fee (see the schedule). No checkouts will occur after this date.

Library Liaison

Yen Tran (yen.tran@sjsu.edu)

Course Requirements and Assignments

This course is primarily based on practical experience, thus attendance for all scheduled lab and lecture sections is mandatory. Two unexcused absences are sufficient for us to fail you in the full course. This includes both wet labs and labs that take place in the computer lab. In addition to time spent in the lab, you are expected to take additional time outside of class to prepare for each lab, learn topics such as techniques, to practice spectroscopy problems and work on your reports.

Each lab experiment has graded work that can include a prelab, notebook, lab report and post-lab quiz. The specific values for each are posted in the gradebook on Canvas and on the lab protocol (also found on Canvas). The grand total of lab-related work will contribute to 50% of your final grade (250 pts). Spectroscopy homework will contribute 30% of your final grade (150 pts). The final exam is worth 100 pts (20%). See the

course schedule (below) and Canvas for due dates, but lab reports will be due at the beginning of the lab period unless otherwise noted.

Assignments	Points
Lab experiments (total)	250
Prelab	25
Notebook	25
Lab Reports	150
Lab Quizzes	50
Spectroscopy Homework	150
Final Exam	100
Total	500

Success in this course is based on the expectation that students will spend, for each unit of credit, a minimum of 45 hours over the length of the course (normally three hours per unit per week) for instruction, preparation/studying, or course related activities, including but not limited to internships, labs, and clinical practica. Other course structures will have equivalent workload expectations as described in the syllabus.

Lab experiments

1. *Prelab.* A major requirement for success in CHEM 113B is advanced preparation. This means you should read the experimental background and procedures carefully before the lab period. You will then be ready to complete the lab in the time allotted. To prepare for the lab, you must write the reagent table and protocol for the experiment in your notebook. Some protocols may also require you to answer some prelab questions. You must turn in a pdf of a legible scanned or photographed copy of your prelab to Canvas at least 1 hour before lab starts. Detailed expectations will be discussed in class and the rubric will be posted on Canvas. One prelab and protocol per group (for group work).
2. *Notebook.* The prelab write-up and all notes and observations from the experiment 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. Instead, correct entries by drawing a line through them. Record all of your notes and observations directly in your notebook as they occur. Don't use scraps of paper or cell phone pictures. The purpose of a lab notebook is to be a record of your lab activities, in such clarity and detail that you or someone else could repeat your experiment successfully based on your notebook. Be organized and legible. You will also upload your notebook pages for the lab on the day your lab report is due. Examples of appropriate a good lab notebook can be found on canvas
3. *Lab report.* The formal lab reports must be in the style of a *Journal of Organic Chemistry* article. Further guidelines and the rubric will be provided on Canvas. Make sure to address all prompts provided in the lab protocol. Any structures in your report should be made in Chemdraw. The written portion of your report must be uploaded on Canvas as a pdf file. You will not that each lab report also has a draft assignment of the "new" part for each lab report. You must turn in a draft and I will edit it and get the comments back to you. This is not optional, you will get points for turning in a draft.
4. *Post-lab quiz.* A short quiz will be given for most experiments on the due date for the lab report. The quiz will interrogate concepts that should have been learned through performing the experiment and analyzing the results in the lab report. Post-lab quizzes will be done through Canvas and will go live the day the lab is due. Once the quiz is open, you will have 15 minutes to complete it.

Spectroscopy lectures and homework

The seminar lectures will describe general background and applications of several spectroscopic techniques that we will use in CHEM 113B. In general, we have limited time to cover problem solving during these sessions. The sessions will be completely asynchronous and will include practice problems and video lectures. These materials can be found on Canvas. You will also be expected to work problems on your own to prepare for the quizzes and final. Additional practice problems can be found in Pavia and any introductory organic text.

Spectroscopy homework will be assigned weekly and will be posted on Canvas. You will have until Friday at 11:59 each week to complete these assignments and upload them to Canvas as .pdf files. These homeworks are open book and notes/Canvas so use any of those materials to your advantage. You are also encouraged to work together. While your work must be your own, feel free to collaborate.

Final Examination or Evaluation

Faculty members are required to have a culminating activity for their courses, which can include a final examination, a final research paper or project, a final creative work or performance, a final portfolio of work, or other appropriate assignment.

In CHEM 113B, we will have a comprehensive final exam based on material from the lab experiments and the spectroscopy seminars. The final will be written in a similar style as the lab and spectroscopy seminar. The lab quiz portion will take place through Canvas Quizzes while the spectroscopy portion will be similar to the spectroscopy homework. Both portions are open book/notes and you are encouraged to collaborate on the spectroscopy portions.

Aids in homework and exams

All homework and exams are open book (Silverstein and Pavia) and open notes.

Grading Information

Determination of Grades

Points will be distributed as described in Course Requirements and Assignments above. I reserve the right to scale quiz and exam grades. If scaled, each quiz or exam will be given a raw score and a scaled score. The raw score will simply be the number of points earned for correct answers on a particular exam or quiz, while the scaled score will reflect your performance on that material as compared with your classmates. The scaled score will be used to calculate your final grade. Scores will never be scaled down from your raw score. Generally, the average score on an exam will be scaled to the C+ range, however, I reserve the right to adjust this in either direction if, in my estimation, the class overall performed differently than a “typical” class. Note, a D- is a passing grade for the course. The course grade will be determined from the resulting average of the point total as follows:

<u>Scaled Score Average</u>	<u>Final Course Grade</u>
97-100	A+
93-96.9	A
90-92.9	A-
87-89.9	B+
83-86.9	B
80-82.9	B-
77-79.9	C+
73-76.9	C

70-72.9	C-
67-69.9	D+
63-66.9	D
60-62.9	D-
< 60	F

Late work

Lab reports submitted after the due date on Canvas are considered late and subject to 5% point reduction (and subsequent 5% point reductions for each further day late). No late reports will be accepted after the Final Exam.

Plagiarism

Plagiarism on lab reports will not be tolerated and will result in a score of 0 points for the report. Additionally, any use of Chegg or other similar sources on exams, quizzes, or reports will be considered cheating/plagiarism and will result in a score of 0 for assignment (which will not be dropped). Further infractions will lead to failure of the course and disciplinary action.

Missed Quizzes

If a quiz or homework is missed without a legitimate excuse, a scaled score of 0 will be entered for that quiz. If an acceptable excuse is provided, then the grade will be prorated. In no case will a make-up quiz be given. Contact me in advance if you will miss a quiz date for a legitimate activity.

Classroom Protocol

Safe and Respectful Community

We hope that the classroom will serve as an environment that will promote learning and the development of new ideas, as well as be a safe and respectful community. Behavior that interferes with the normal academic function in a classroom is unacceptable. Students exhibiting this behavior will be asked to leave the class. The university has a [brochure on student conduct](http://www.sjsu.edu/studentconduct/docs/ENGLISH%20Brochure.pdf) that you can view at <http://www.sjsu.edu/studentconduct/docs/ENGLISH%20Brochure.pdf>.

Consent for Recording of Class and Public Sharing of Instructor Material

[University Policy S12-7](http://www.sjsu.edu/senate/docs/S12-7.pdf), <http://www.sjsu.edu/senate/docs/S12-7.pdf>, requires students to obtain instructor's permission to record the course.

1. "You must obtain the instructor's permission to make audio or video recordings in this class. Such permission allows the recordings to be used for your private, study purposes only. The recordings are the intellectual property of the instructor; you have not been given any rights to reproduce or distribute the material."
2. "Course material developed by the instructor is the intellectual property of the instructor and cannot be shared publicly without his/her approval. You may not publicly share or upload instructor generated material for this course such as exam questions, lecture notes, or homework solutions without instructor consent."

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. Read the [Safety Rules for Teaching Laboratories](http://www.sjsu.edu/chemistry/Documents/Safety%20Sheet%20for%20Teaching%20Laboratories_053118.pdf) on the chemistry department website found at http://www.sjsu.edu/chemistry/Documents/Safety%20Sheet%20for%20Teaching%20Laboratories_053118.pdf.

3. Pass (grade of 80% or above) a short quiz on laboratory safety.

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

In addition:

1. Always wear safety goggles in the lab when anyone is conducting an experiment.
2. We will be using some flammable solvents, do not have any flames when you (or someone else in the room) are handling flammable solvents.
3. Treat all reagents as potential hazards. Use gloves properly and avoid skin contact. In case of contact, inform the instructor immediately and flush with water for 15 min. Similarly, if you have a spill, never leave it unattended and let the instructor know.
4. Glassware breaks. Use caution in any experimental procedure, and exchange any chipped or cracked glassware. Notify the instructor of broken glass so she can assist in clean up. Dispose of all glassware in the broken glass bins, not in the trash cans.
5. 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.
6. 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 instructor's directions.

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 instruments. These will be provided by the instructor. If you have any question or uncertainty about use of any instrument do not hesitate to ask.

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 will be disenrolled from the class.

Chemical Safety (CHEM 120S)

CHEM 120S (Chemical Safety) is a required course for all chemistry majors and minors.

Emergencies and Building Evacuations

If you hear a continuously sounding alarm, or are told to evacuate the building by an Emergency Coordinator, walk quickly to the nearest exit (out the door and turn left to exit the Science Building). Take your personal belongings as you may not be allowed to return. Follow the instructions of the Emergency Coordinators. Be

quiet so you can hear instructions. Once outside, move away from the building. Do not return to the building unless the Police or the Emergency Coordinator announce that this is permissible.

Students planning to take CHEM 114

If you plan to take CHEM 114, note that the prerequisite of CHEM 100W (or equivalent course approved by your advisor) will be strictly enforced. Students without a 100W course completed will not be allowed to enroll in CHEM 114.

University Policies

Per University Policy S16-9, university-wide policy information relevant to all courses, such as academic integrity, accommodations, etc. will be available on Office of Graduate and Undergraduate Programs' [Syllabus Information web page](http://www.sjsu.edu/gup/syllabusinfo/) at <http://www.sjsu.edu/gup/syllabusinfo/>.

CHEM 113B, Organic Lab (II), Section 02, Spring 2021, Lab Course Schedule

The schedule is subject to change. Changes will be noted in class.

Class	Date	Activities	Assignments Due
1	Jan 27	Module 0: Introduction, safety quiz, lab expectations (On canvas, not in-person)	
2	Feb 1	Module 1: ChemDraw Lab - Remote via Zoom	Safety Quiz (Must score above 80%)
3	Feb 3	Work on Module 1: ChemDraw Lab - Asynchronous (Videos and instructions can be found on Canvas)	
4	Feb 8	Module 2: 1D NMR Lab – Remote via Zoom	ChemDraw lab due
5	Feb 10	Work on Module 2: 1D NMR Lab - Asynchronous	
6	Feb 15	Check-in/ Begin Module 3: Unknown solid lab	1D NMR Lab Due
7	Feb 17	Check-in/ Module 3: Unknown solid lab	Unknown Solid Prelab
8	Feb 22	Module 3: Unknown solid lab	
9	Feb 24	Module 3: Unknown solid lab (Discussion – Remote via Zoom)	
10	Mar 1	Module 4: 2D NMR lab (In-lab, one partner only)	Unknown Solid Results and Discussion Draft
11	Mar 3	Module 4: 2D NMR lab – Remote via Zoom	
12	Mar 8	Module 5: Bromohydrin Lab	Bromohydrin Prelab
13	Mar 10	Module 5: Bromohydrin Lab	Unknown Solid Lab Report (Results and Discussion only) Unknown Solid Notebook Unknown Solid Quiz
14	Mar 15	Module 5: Bromohydrin Lab	
15	Mar 17	Module 5: Bromohydrin lab (Discussion – Remote via Lab)	
16	Mar 22	Module 6: Unknown esters lab	Unknown Ester Prelab
17	Mar 24	Module 6: Unknown esters lab	Bromohydrin Introduction Draft
	<i>Mar 29+31</i>	<i>Spring Break!</i>	
18	Apr 5	Module 6: Unknown esters lab	Bromohydrin Lab Report (Results and Discussion and Introduction) Bromohydrin Notebook Bromohydrin Quiz
19	Apr 7	Module 6: Unknown esters lab – Remote via Zoom	
20	Apr 12	Module 6: Unknown esters lab - (Discussion – Remote via Lab)	
21	Apr 14	Module 7: Menthol Lab	Menthol Prelab Unknown Ester Abstract and Conclusion Drafts

Class	Date	Activities	Assignments Due
22	Apr 19	Module 7: Menthol Lab	
23	Apr 21	Module 7: Menthol Lab	
24	Apr 26	Module 7: Menthol Lab	Unknown Ester Lab Report (Abstract, Introduction, Results and Discussion, and Conclusion) Unknown Ester Notebook Unknown Ester Quiz
25	Apr 28	Module 7: Menthol Lab	
26	May 3	Module 7: Menthol Lab	Menthol Lab Experimental for Part 1 and 2 Draft
27	May 5	Module 7: Menthol Lab	
28	May 10	Module 7: Menthol Lab ((Discussion – Remote via Lab)	
29	May 12	Lab Checkout – Group 1	
30	May 17	Lab Checkout – Group 2	Menthol Quiz Due
	Tuesday, May 25	Final Exam Due Menthol Lab Due	

CHEM 113B, Organic Lab (II), Section 01, Spring 2021, Seminar Course Schedule

The schedule is subject to change. Changes will be noted in class.

Week	Topic	Reading	Assignments/Videos
1	Module 1: Intro to structure determination; review of IR spectroscopy	Silverstein – Ch 2 Pavia – Ch 2	Week 1 Homework (Due 2/3) IR Lecture
2	Carbon-13 NMR I	Pavia – Ch 6, 9.4-9.5; <i>Ch 5.1-5.6, 5.8, 5.10-5.12 (review)</i> Silverstein – Ch 4; <i>Ch 3.1-3.4, 3.8-3.9 (review)</i>	Week 2 Homework Carbon-13 NMR Lecture
3	Proton NMR I	Pavia - <i>Ch 5.1-5.6, 5.8, 5.10-5.12, 5.19 (review)</i> Silverstein - <i>Ch 3.1-3.4, 3.8-3.9 (review)</i>	Week 3 Homework Proton NMR I Lecture
4	Proton NMR II	Pavia – Ch 5.9, 5.13-5.18, 5.20, Ch 7 Silverstein – Ch 3.5, 3.12-3.14, 3.16	Week 4 Homework Proton NMR II Lecture
5	Proton NMR III	Pavia – Ch 5.9, 5.13-5.18, 5.20, Ch 7 Silverstein – Ch 3.5, 3.12-3.14, 3.16	Week 5 Homework
6	2D NMR I	Pavia – Ch 9.7 Silverstein – 5.1-5.4, 5.4.3-5.4.5, 5.8-5.8.1, 5.10-5.10.1	Week 6 Homework 2D NMR I Lecture
7	2D NMR II	Pavia – Ch 9.7 Silverstein – 5.1-5.4, 5.4.3-5.4.5, 5.8-5.8.1, 5.10-5.10.1	Week 7 Homework

8	2D NMR III	Pavia – Ch 9.7 Silverstein – 5.1-5.4, 5.4.3-5.4.5, 5.8-5.8.1, 5.10-5.10.1	Week 8 Homework
9	2D NMR IV	Pavia – Ch 9.7 Silverstein – 5.1-5.4, 5.4.3-5.4.5, 5.8-5.8.1, 5.10-5.10.1	Week 9 Homework
	<i>Spring Break!</i>		
10	2D NMR V	Pavia - Ch 8.1-8.7 Silverstein - Ch 1.5.3	Week 10 Homework
11	Mass Spectrometry I	Pavia – Ch 8.8 (all) Silverstein – Ch 1.5.4 to 1.6.17	Week 11 Homework Mass Spectrometry I Lecture
12	Mass Spectrometry II	Pavia – Ch 8.8 (all) Silverstein – Ch 1.5.4 to 1.6.17	Week 12 Homework Mass Spectrometry II Lecture
13	Combined Spectroscopy I		Week 13 Homework
14	Combined Spectroscopy II		Week 14 Homework
15	Combined Spectroscopy III		Week 15 Homework