San José State University
Chemistry Department, College of Science
Chem 08, Organic Chemistry, Spring 2022

Course and Contact Information

Instructor:	Laura Kapitzky, PhD
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Office Hours:	Tuesdays 11:00 AM – 12:00 PM and by appointment on Zoom.
Class Days/Time:	Tuesdays and Thursdays 9:00 AM - 10:15 AM
Classroom:	Duncan Hall Room 351
Prerequisites:	CHEM 001B (with a grade of "C" or better; "C-" not accepted). Notes: CHEM 008 is not a satisfactory prerequisite for CHEM 112B. No credit toward Chemistry major or minor.

Course Format

- Chem 8 will be conducted as a hybrid course.
  - **Video lectures, reading assignments, homework assignments, quizzes,** and all other learning materials will be available on Canvas. These will be completed outside of class time.
  - **Live Tuesday/Thursday class meetings** will be a combination of lecture and working of practice problems relevant to that week's module. You are expected to have access to an electronic device with internet connectivity to access Canvas during class (a phone will suffice but a larger screen will make it easier to view documents). You are strongly encouraged to view the specified video lectures before each class meeting.

- There will be weekly assignments to make sure you keep up with the material. These assignments will include a homework assignment and a short Canvas quiz on the week's material. These items may be completed at any time during the week as long as they are submitted before the designated due date and time. The due dates follow a consistent pattern throughout the semester so you can plan them into your weekly schedule.

- There will be three midterm exams and a final exam, all to be taken in person. Please put these dates on your calendar. Note that all midterms are held during our scheduled class time, and the final will take place during the scheduled final exam timeslot for our course. These exams will take place on:
  - **Midterm 1: Thursday, March 3rd from 9am - 10:15am**
  - **Midterm 2: Thursday, April 7th from 9am - 10:15am**
  - **Midterm 3: Thursday, May 5th 9am - 10:15am**
  - **Final: Monday, May 23rd from 7:15am – 9:30am**

Canvas and MYSJSU Messaging

Course materials such as syllabus, handouts, notes, assignment instructions, etc. can be found on Canvas Learning Management System course login website at http://sjsu.instructure.com. You are responsible for regularly checking the messaging service on Canvas to learn of any updates. I will frequently post announcements to our course website on Canvas – be sure to adjust your Canvas notification settings so that you receive announcements directly in your email or Canvas Inbox as you prefer.

Course Description

Introduction to the chemistry of carbon compounds for allied health majors and others requiring only 3 units of organic chemistry lecture. Prerequisite: CHEM 001B (with a grade of "C" or better; "C-" not accepted). Notes: CHEM 008 is not a satisfactory prerequisite for CHEM 112B. No credit toward Chemistry major or minor.

Chemistry 8 is designed to introduce you to organic chemistry in a one-semester course format. This course intends to familiarize you with the basic concepts and properties of molecules based on carbon.

Course Goals and Course Learning Outcomes (CLO)

CHEM 8	• Appreciation for the nature and scope of organic chemistry. • Application of key concepts from general chemistry including electronegativity, bonding (ionic and covalent), hybridization of atomic orbitals, and molecular orbital theory to organic systems. • Draw valence bond and Lewis dot structure for organic species, including formal charges. • Draw skeletal structures for organic compounds. • Apply acid-base concepts to organic systems; predict ordering of acid or base strength. • Name alkanes, alkenes, polyenes, alkynes, alkyl halides, aromatic compounds, carbonyl compounds, amines, and their various derivatives using systematic (IUPAC) nomenclature. • Learn common names for some key chemicals. • Draw reaction mechanisms for some key reactions. • Recognize stereochemistry and be able to apply the Cahn-Ingold-Prelog system to the designation of stereochemistry (E/Z or R/S). • Learn many of the reactions of alkanes, alkenes, polyenes, alkynes, aromatic, carbonyl, and amine compounds, and closely related species. Be able to predict reactions involving these functional groups. • Be able to solve problems employing spectroscopic methods including mass spectrometry, infrared and NMR spectroscopy • Understand the basic chemical and structural features of biomolecules, including lipids, carbohydrates, amino acids and proteins, and nucleic acids.

Program Learning Objectives

I. Core Chemistry Ideas (Fundamentals)

PLO 1.1 - Students will be able to identify, formulate, and solve a range of chemistry problems (fundamental to complex) through application of mathematical, scientific, and chemical principles.

PLO 1.2 - Students will be able to recognize, relate, and/or apply chemistry terms and concepts to propose and solve interdisciplinary and multidisciplinary real world problems.

II. Experimentation/Lab Practice

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 *a*cquire, 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.

III. Community, Social, Societal Implications

PLO 3.1 Students will be able to explore, critique, and reflect on how chemistry relates to society, culture, and issues of equity and ethics that shape their scientific beliefs and identities.

PLO 3.2 Students will be able to identify as scientists within the scientific community through constructing peer reviews, engaging in collaborations, and participating in mentorship.

IV. Communication Skills

PLO 4.1 Students will be able to design and deliver engaging presentations on diverse chemistry topics in a professional manner and with clear, concise organization that demonstrates mastery of the topic.

PLO 4.2 Students will be able to integrate research findings into a concise original written report that either analyzes collected data and obtained results or reviews and reflects on published scientific work.

PLO 4.3 Students will be able to identify an audience and construct a message tailored to that audience and act as a science ambassador by conveying the importance of the research or topic of study.

PLO 4.4 Students will be able to prepare professional documents, such as résumés and cover letters, that accurately represent the students' skills and knowledge for graduate/professional school or potential future employers.

Required Texts/Readings

Textbook

- Our textbook for the course is **'Organic Chemistry with a Biological Emphasis' by Tim Soderberg**. This is a free open-access eBook available for download online and from the SJSU Library. We will be picking and choosing topics from the two volumes of this book, so I suggest you download the PDF files for both Volumes 1 and 2:
    - Volume 1 (https://digitalcommons.morris.umn.edu/chem_facpubs/1/)
    - Volume 2 (https://digitalcommons.morris.umn.edu/chem_facpubs/2/)
    - Solutions to in-chapter problems (https://digitalcommons.morris.umn.edu/chem_facpubs/3/)
    - Solutions to end-of-chapter problems (https://digitalcommons.morris.umn.edu/chem_facpubs/4/)

- If you prefer a print copy of the book, you can order them at the links below ($15 each volume, probably some shipping charges on top of that)
    - Order volume 1 print copy
    - Order Volume 2 print copy

Other technology requirements / equipment / material

- You will need access to a web-enabled cell phone or tablet with a working camera
- Additionally, you will need a computer or tablet capable of running one of the common web browsers (Firefox, Chrome, Explorer)
- An optional but useful item is a **molecular modeling kit**. There are many different types available for purchase online starting at $20 new – search for "Organic Chemistry Modeling Kit' and you should find many options.
    - You can also just use your hands, although this is not quite as foolproof as a real kit:
        - https://www.masterorganicchemistry.com/2011/02/11/the-worlds-cheapest-molecular-model-kit/

CoS COVID-19 Safety Language for Syllabi

We have also updated the paragraph for the syllabi of courses with in-person components:
All students registered for a College of Science (CoS) class with an in-person component must view the CoS COVID-19 Training slides and the SJSU Phased Adapt Plan website and acknowledge reading them according to their instructor's directions. By working together to follow these county and SJSU safety practices, we can keep our college safer. Students who do not follow COVID-19 Safety practice(s) outlined in the training, the SJSU Phased Adapt Plan, or instructions from their instructors, TAs or CoS Safety Staff may be dismissed from CoS buildings, facilities or field sites. Please review this training as needed throughout the semester, as updates will be implemented as changes occur (and posted to the same links).

Course Requirements and Assignments

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. Please review the information contained in the following links:

- *University Syllabus Policy S16-9 at http://www.sjsu.edu/senate/docs/S16-9.pdf.*
- *Office of Graduate and Undergraduate Programs' Syllabus Information web page at http://www.sjsu.edu/gup/syllabusinfo/*

Attendance

Attendance at our Tuesday/Thursday class meetings is expected.

Readings

There will be weekly reading assignments in the Soderberg textbook. They are a bit lengthy. I recommend you make a reading outline based on the week's learning objectives – it will help keep you focused on the most important material.

Video Lectures

Each week there will be several video lectures to watch. Some will have the accompanying slides available for download. Treat these video lectures as you would a traditional face-to-face lecture – take notes as you go, review your notes after "class".

Practice Problems

For many modules there are sets of practice problems with provided solutions available. Working these practice problems is **highly recommended** but not required. The practice problems are not submitted for a grade. We will work many of them during our Tuesday/Thursday class periods.

Homework

There will be weekly homework assignments to ensure you are practicing working with the material. The assignments come from the **in-chapter problems** for the week's reading assignment. The homework problems are not the end-of-chapter problems.

Quizzes

At the end of each week, there will be a brief online quiz due that covers the material from the week. The quizzes can be taken repeatedly until the quiz due date and the highest score earned will be the one recorded. So while the quizzes are graded activities, they also provide a good opportunity to practice key skills in preparation for the exams.

Exams

There will be 3 midterm exams and a final exam. You are required to take all three midterm exams. If your midterm exam average is A- or higher (>/=90%) going into the final exam, you are excused from the final exam. If your midterm exam average is B+ (<90%) or lower, you are required to complete the final exam.

Grading Information

Your final letter grade in the class will be based on your weighted average score on all graded assignments. The assignments will be weighted according to the following percentages:

3 Midterm Exams	45%
1 Final Exam (cumulative)	20%
Homework	15%
Quizzes	20%

A tentative breakdown of the assignment of letter grades to percentages is as follows:

Grade	Percentage
A plus	96 to 100%
A	93 to 95%
A minus	90 to 92%
B plus	86 to 89 %
B	83 to 85%
B minus	80 to 82%
C plus	76 to 79%
C	73 to 75%
C minus	70 to 72%
D plus	66 to 69%
D	63 to 65%
D minus	60 to 62%
F	Below 60%

Make-up, Late, and Missed Work Policy

This guideline supersedes all of the policies that follow:

If you know you are going to miss an assignment in advance, **contact me ahead of time** and we will make reasonable accommodations for your situation. There is a lot going on in the world right now and I am more than happy to offer you grace to help you through tough times. The exception to this is the midterm exams. Please make every effort to take the midterms as scheduled.

Homework. Homework submitted after the due date and time for the assignment will be docked 50% per day. Homework cannot be submitted more than one day late, will receive a zero, and cannot be made up. Note: it is still worth doing your homework even if you will not receive full (or any) credit for it. The lowest homework score will be dropped from your final grade.

Quizzes. There are no make-up quizzes. If you miss a quiz due date for any reason, your score will be recorded as zero and you cannot make it up. To accommodate unpredictable life events, the lowest quiz score will be dropped from your grade.

Midterm exams. If you miss a midterm exam for a valid, documented reason, your missed exam score will be replaced with the average of the other two midterms. Missing an exam without a documented reason will result in a zero score for the midterm.

Academic Integrity

I expect you to conduct yourself with the highest degree of academic integrity. Any violations of the University Policy on Academic Integrity will be pursued. The definitions of Academic Dishonesty are described below. Please follow the link to find the repercussions of academic dishonesty at San José State University.

DEFINITIONS OF ACADEMIC DISHONESTY from University Policy F15-7 Academic Integrity

- CHEATING
    - San José State University defines cheating as the act of obtaining credit, attempting to obtain credit, or assisting others to obtain credit for academic work through the use of any dishonest, deceptive, or fraudulent means. Cheating includes:
        - copying, in part or as a whole, from another's test or other evaluation
        - instrument, including homework assignments, worksheets, lab reports, essays, summaries, and quizzes;
        - submitting work previously graded in another course without prior approval by the course instructor or by departmental policy.
        - submitting work simultaneously presented in two or more courses without prior approval of all course instructors or by the departmental policies of all departments;
        - using or consulting sources, tools, or materials prohibited by the instructor prior to or during an examination;
        - altering or interfering with the grading process;
        - sitting for an examination by a surrogate or as a surrogate;
        - any other act committed by a student in the course of his or her academic work that defrauds or misrepresents, including aiding others in any of the actions defined above.

- PLAGIARISM
    - San José State University defines plagiarism as the act of representing the work of another as one's own without giving appropriate credit, regardless of how that work was obtained, and submitting it to fulfill academic requirements. Plagiarism includes:
        - knowingly or unknowingly incorporating the ideas, words, sentences, paragraphs, parts of sentences or paragraphs, or the specific substance of another's work without giving appropriate credit, and representing the product as one's own work;
        - representing another's artistic or scholarly works, such as computer programs, instrument printouts, inventions, musical compositions, photographs, paintings, drawings, sculptures, novels, short stories, poems, screenplays, or television scripts, as one's own.

University Policies

Per University Policy S16-9 *(http://www.sjsu.edu/senate/docs/S16-9.pdf)*, relevant information to all courses, such as academic integrity, accommodations, dropping and adding, consent for the recording of class, etc. is available on Office of Graduate and Undergraduate Programs' Syllabus Information web page at http://www.sjsu.edu/gup/syllabusinfo/".

Chem 8, Organic Chemistry, Spring 2022

Course Schedule

The following is a tentative schedule for the course. Dates are subject to change with notice. Notice will be provided via Canvas announcements.

Date	Day	Module	The Day's Topics and Videos to View Before Class	Assignments Due
1/26	Wednesday	Module 0 - Online		
1/27	Thursday		Welcome and overview of the course (no preparation needed)	
1/28	Friday			
1/29	Saturday			
1/30	Sunday			
1/31	Monday	Module 1 - Online		
2/1	Tuesday		Line Structure Representation in Organic Molecules; Common Bonding Patterns in Organic Molecules; Formal Charge	
2/2	Wednesday			
2/3	Thursday		IUPAC Nomenclature of Hydrocarbons; Introduction to organic functional groups; Recognizing Organic Functional Groups in a larger molecule	
2/4	Friday			
2/5	Saturday			
2/6	Sunday			
2/7	Monday	Module 2 - Online		Quiz 1 Due
2/8	Tuesday		Introduction to Biomolecules; Orbital hybridization and bonding in organic molecules	
2/9	Wednesday			
2/10	Thursday		How to recognize the hybridization of an atom in an organic molecule; Aromaticity and Resonance	Homework 1 Due
2/11	Friday			
2/12	Saturday			
2/13	Sunday			
2/14	Monday	Module 3		Quiz 2 Due
2/15	Tuesday		Resonance in organic chemistry; Intermolecular forces and physical properties	
2/16	Wednesday			
2/17	Thursday		Intermolecular forces and physical properties; Protonation State and Solubility	Homework 2 Due
2/18	Friday			
2/19	Saturday			
2/20	Sunday			

2/21	Monday	Module 4		Quiz 3 Due
2/22	Tuesday		Conformations of linear molecules; Conformations of cyclic molecules; What is chirality and how did it get in my molecules; Identifying Chiral molecules and chiral centers	
2/23	Wednesday			
2/24	Thursday		Designating stereocenters R or S; Recognizing and classifying stereoisomers	Homework 3 Due
2/25	Friday			
2/26	Saturday			
2/27	Sunday			
2/28	Monday	Module 5		Quiz 4 Due
3/1	Tuesday		Relating Fischer projections to wedge-and-dash structures; Alkenes: cis, trans, E, Z	
3/2	Wednesday			
3/3	Thursday		**Midterm Exam 1 (Covers Modules 1 - 4)**	Homework 4 Due
3/4	Friday			
3/5	Saturday			
3/6	Sunday			
3/7	Monday	Module 6		Quiz 5 Due
3/8	Tuesday		Structure determination in organic chemistry; Introduction to Mass Spectrometry; Interpreting Mass Spectra	
3/9	Wednesday			
3/10	Thursday		Review of the EM spectrum; UV-Vis spectroscopy - The Basics	Homework 5 Due
3/11	Friday			
3/12	Saturday			
3/13	Sunday			
3/14	Monday	Module 7		Quiz 6 Due
3/15	Tuesday		IR Spectroscopy - The Basics; The Anatomy of a IR Spectrum; Hilighting Common IR Signals	
3/16	Wednesday			
3/17	Thursday		Interpreting IR Spectra	Homework 6 Due
3/18	Friday			
3/19	Saturday			
3/20	Sunday			
3/21	Monday	Module 8		Quiz 7 Due
3/22	Tuesday		NMR Spectroscopy - The Basics; Interpreting NMR Spectra - Anatomy of a Spectrum; Number of Signals in a Spectrum	
3/23	Wednesday			
3/24	Thursday		Chemical Shift; Peak Integration; Multiplicity and the n+1 rule	Homework 7 Due

3/25	Friday			
3/26	Saturday			
3/27	Sunday			
3/28	Monday	Spring Break		
3/29	Tuesday			
3/30	Wednesday			
3/31	Thursday			
4/1	Friday			
4/2	Saturday			
4/3	Sunday			
4/4	Monday	Module 9		Quiz 8 Due, Homework 8 Due
4/5	Tuesday		Watch all videos in the module this week, but does not have to happen before this class meeting.	
4/6	Wednesday			
4/7	Thursday		**Midterm Exam 2 (Covers Modules 5 - 8)**	
4/8	Friday			
4/9	Saturday			
4/10	Sunday			
4/11	Monday	Module 10		Quiz 9 Due
4/12	Tuesday		Exergonic and Endergonic Reactions, What do Catalysts Do, Enzymes and Catalysis, Bronsted-Lowry Acids and Bases, Lewis Acids and Bases.	
4/13	Wednesday			
4/14	Thursday		pKa, Ka, Acid Strength; Acid/base equilibria; Using the Henderson Hasselbalch Equation	Homework 9 Due
4/15	Friday			
4/16	Saturday			
4/17	Sunday			
4/18	Monday	Module 11		Quiz 10 Due
4/19	Tuesday		What makes an acid strong; ionization states	
4/20	Wednesday			
4/21	Thursday		What are tautomers; keto-enol tautomerization; imine-enamine tautomerization	Homework 10 Due
4/22	Friday			
4/23	Saturday			
4/24	Sunday			
4/25	Monday	Module 12		Quiz 11 Due
4/26	Tuesday		Sn1 Reactions; Sn2 Reactions	
4/27	Wednesday			
4/28	Thursday		A comparison of Sn1 and Sn2; Will the reaction proceed as Sn1 or Sn2	Homework 11 Due
4/29	Friday			
4/30	Saturday			

5/1	Sunday			
5/2	Monday	Module 13		Quiz 12 Due
5/3	Tuesday		Watch all videos in the module this week, but does not have to happen before this class meeting.	
5/4	Wednesday			
5/5	Thursday		**Midterm Exam 3 (Covers Modules 9 -12)**	Homework 12 Due
5/6	Friday			
5/7	Saturday			
5/8	Sunday			
5/9	Monday	Module 14		Quiz 13 Due
5/10	Tuesday		Acetals and ketals; carbohydrates - cyclization; glycosidic bond formation	
5/11	Wednesday			
5/12	Thursday		Carboxylic Acid Derivatives; Nucleophilic Acyl Addition and Substitution; Hydrolysis of Esters and Amides	Homework 13 Due
5/13	Friday			
5/14	Saturday			
5/15	Sunday			
5/16	Monday	Last day of classes		Quiz 14 Due, Homework 14 Due
5/17	Tuesday			
5/18	Wednesday			
5/19	Thursday			
5/20	Friday			
5/21	Saturday			
5/22	Sunday			
5/23	Monday		**Final Exam 7:15 AM - 9:30 AM (Covers Modules 1 - 14)**	
Wed	5/24		Make up day	