

Chem. 130 Organic Chemistry

Summer 2021

Schedule number: **20757**

Professor Jeffrey Gustafson

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COURSE INFORMATION

Class Days: MWF

Office Hours: MWF 10-10:50

Class Times: lectures 11:00-11:50

Office Hours Location: ZoomID: 847 5257 4414

Class Location: SHW011 or at zoom ID: 847 5257 4414

***all lectures will be virtual through 2/7)

Course Overview

Chem 130 covers the fundamental organic chemistry needed for fields related to health and the environment. Importantly this class will prepare students for Chem 160 (biochemistry), and thus we will spend time on applications of organic chemistry to biochem (after all biochem is just applied organic chemistry). Organic chemistry differs from general chemistry in that it focuses on only a few elements (C, H, N, O, F, Cl, Br, I). The 3-dimensional shape of molecules is particularly important and thus a molecular model kit (sold at book store) is HIGHLY recommended (and will be allowed on exams). We will also discuss fundamental organic transformations and how they are applied to everyday life.

Enrollment Information

Prerequisites: The prerequisite for Chem 130 is Chem 100. **If you have not taken Chem 100 or Chem 200, then you should not be taking this course.** (Note: Other college chemistry courses may qualify as a prerequisite. I will consider these and you should contact me via email ASAP.)

Course Materials

Required Text: Introduction to organic chemistry by William H Brown and Thomas Poon (Wiley)

**** **This is an immediate Access Course:** Some or all of the required course materials for this class are provided in a digital format by the first day of classes and are free through the add/drop date of **February 4th, 2022**. Your SDSU student account will then be charged a special reduced price for use of the materials for the remainder of the semester unless you opt-out of the content by 11:59 PM on the add/drop date. Please visit www.shopaztecs.com/immediateaccess for additional information about Immediate Access pricing, digital subscription duration, print add-ons, opting out and other frequently asked questions.

Optional Model Kit: Prentice Hall Molecular Modeling Kit for Organic Chemistry (or comparable).

Electronic Homework: The best way to learn organic chemistry is through doing it. Thus ~17% of the classes' grade (130 points scaled based on percentage of HW points received) will be from homework. Unfortunately hand graded homework is not feasible so we have to turn to online homework. We will be using the online homework that comes with the textbook via Wiley plus. The homework will be due at 1100 AM the day of the exam that covers that chapter. **IT IS BEST TO DO THE HOMEWORK AS WE GO RATHER THAN TO WAIT UNTIL THE DAY IT IS DUE.** To make up for any poor questions or technical glitches, the homework score will be curved up at the end of the semester as needed.

Lecture Notes: The PPT notes of the class will be put up on canvas after each lecture. These notes cover the major topic I will go over, **but are not a replacement for coming to class and reading the book!!** Lectures will be recorded and posted on Canvas.

Office Hours: Office hours will be virtual via zoom. In my office hours I will go over examples and concepts from the lectures by student request. **If you have a non-chemistry related question it will be best to contact me via email outside of office hours.**

There will also be a class discussion board on blackboard where you can post your science questions. I will check it periodically to curate it. **Other students are encouraged to answer other students' questions on the discussion board, extra credit participation points will be assigned based on participation in the online board (2.5 points per correct help, 1 point for incorrect help, 1 point per question asked) up to 25 points for the semester).**

Extra credit: in addition to extra credit participation points on the course discussion boards (25 points), Students can also earn extra credit for submitting a meme related to a topic in the class. Students can submit up to 6 memes over the semester (limited to 2 per exam period). Each correct meme will be awarded 5 extra credit points (**up to 30 total**). The memes are to be uploaded on the Meme discussion board. If the memes are scientifically incorrect, or not of a topical scientific nature, the student will get no points. If an incorrect meme that is scientifically incorrect is posted, and then corrected the original poster will get credit. Some other guidelines are below:

- 1) For credit there must be significant scientific content that would contribute to the class's understanding of a topic. Examples will be posted. No scientific content, no credit
- 2) The original posting of memes must occur 24 hours before the exam that covers the topic. Memes that are on a topic that are not relevant to the upcoming topic will not be given credit.
- 3) Memes must be professional and not offensive in anyway. This is supposed to be a fun wholesome way to learn a difficult topic.
- 4) I recommend making your own memes rather than searching the internet... Students in past classes find it takes less time to make your own meme (OC), **AND YOU WILL LEARN MORE WHICH IS THE POINT!!!!!!**

Course Structure and Conduct

This course will be taught in a traditional lecture 'chalk talk' format in person and livestreamed via zoom, with each lecture posted on canvas shortly after. While students are encouraged to join the livestream (and ask questions) being present for the livestream is not required. **It is imperative you start the post-chapter homework as we cover the chapter in lecture.** It is also important that you read the book and do the pre-lecture homework before lecture so that you are somewhat familiar with the material as I present it. I will post PPT notes that will be a skeleton of my lectures to help you follow along. As there is a large amount of material to be covered, I ask that questions be saved for before class, during my office hours, or after my lecture. The best advice for this class is to be proactive. Start the homework early, come to my office hours if you feel you are falling behind, and read ahead in the book and notes.

Course Assessment and Grading

Exams: There will be three exams, each on a Friday. Exams will be asynchronous, and administered on canvas. Students can take them anytime between 11:00 AM and 11:59 PM that day, but will be limited to two hours. To ensure the integrity of the exam, you will be required to send me proof you took the exam. The exams will be administered on canvas. **Dates: Exam 1 (chap 1-4): February 18th. Mar 25th (chap 5-9): May 4th. Exam 3 (chapter 10,12-14): July 2nd.** Please note there will be no cumulative final exam, rather exam 3 will be on the final day of the semester. All exams will be open book and open notes, however each exam will have a lot of material thus being prepared and organized will be essential.

There will be no make-up exams or dropped exams. The online homework is worth **130 points**. **Your final grade will be based on a maximum of 730 points, distributed as follows: 3 exams (200 points each), Online Homework (130 points).** ***please note students can earn up to 55 points extra credit via the chemistry Meme extra credit (5 points per meme) , and participation on the class discussion board ****

Letter Grade Assignment: Depending on class performance the Exams may be curved, **but never downward**. If necessary the class average of each exam will be curved upward to a 72 % (the lowest B-). Please note that the grade distribution below is just a guide, and may change according to class performance.

90%	A	66%	C
88%	A-	62%	C-

86%	B+	58%	D+
76%	B	54%	D
72%	B-	50%	D-
70%	C+	<50%	F

Student Learning Outcomes (broken down by chapter...basically the type of questions that will be asked on exams) The included schedule is tentative and subject to change:

Chapter 1-Covalent bonding and Shapes of molecules (1//19-1/28)

- 1) Describe the electronic structure of atoms.
- 2) Use the Lewis model of bonding to describe the nature of a bond between 2 atoms
- 3) Use VSEPR theory to predict the shape of simple organic molecules
- 4) Use the concepts in SLO 1.1-1.3 to identify polar and non-polar molecules
- 5) Understand the concept of 'resonance' and apply it to a better understanding of how a molecule truly exists (as compared to the Lewis Dot Structure)
- 6) Gain a basic understanding of hybridization and the orbital overlap model of bonding.
- 7) Be able to identify whether an atom is sp , sp^2 , or sp^3
- 8) Identify common functional groups

Chapter 2-Acids and Bases: (1/31-2/4)

- 1) Identify Arrhenius, Bronsted-Lowry, and Lewis Acids and Bases
- 2) Understand the relationship between pK_a and acidity, and how pK_a is calculated.
- 3) Using pK_a data, predict the equilibrium of an Acid-Base reaction.
- 4) Identify conjugate acid-base pairs for Bronsted-Lowry acids and bases.
- 5) Relate position in periodic table to acidity.
- 7) Draw relationships between acidity and molecular structure

Chapter 3-Alkanes and cycloalkanes: (2/7-2/11)

- 1) Describe what an alkane is
- 2) Identify constitutional isomers of an alkane.
- 3) Name simple alkanes according to IUPAC Rules
- 4) Describe the different conformations of alkanes and cycloalkanes. Relate conformation to energy level
- 5) Draw the condensed and line-angle structural formulas and give the names for the cis-trans isomers of alkenes.
- 6) Understand the molecular properties and trends that lead to varying physical properties of alkanes.
- 7) Explain where many alkanes come from.

Chapter 4-Alkenes and Alkynes: (2/14-2/16)

- 1) Describe what alkenes and alkynes are. Describe their structures, shapes, and physical properties.
- 2) Name simple alkenes and alkynes according to IUPAC rules.

2/18: exam 1 on Chapters 1-4. homework for chapter 1-4 due at 11:00 AM

Chapter 5-Reactions of alkenes and alkynes: (2/21-2/25)

- 1) Understand the concept of a reaction mechanism and how we denote electron movement via 'arrow pushing'
- 2) Understand the basic idea of electrophilic addition reactions to alkenes and alkynes.
- 3) Understand what a carbocation is and the factors that lead to carbocation stability trends.
- 4) Describe a Carbocation rearrangement.
- 5) Understand the basic idea behind the reduction of alkenes to alkenes, and alkynes to alkenes.

Chapter 6-Chirality and the handedness of molecules: (2/28-3/2)

- 1) Understand the difference between isomers, stereoisomers, and enantiomers (non superimposable mirror images). Draw a connection between molecular chirality and handedness.
- 2) Know what a stereocenter is, and how we designate it's conformation using 'R and S' nomenclature.
- 3) Describe how we deal with molecules with multiple stereocenters.
- 4) Describe the differences in physical properties between stereoisomers.
- 5) Understand the real world consequences of chirality (i.e. thalidomide).

Chapter 7-Haloalkanes (3/4-3/9)

- 1) Name simple Haloalkanes using IUPAC rules and predict the physical properties of them using concepts previously learned in class.
- 2) Describe the products and mechanism of nucleophilic aliphatic substitution reactions (S_N1 and S_N2)
- 3) Understand the mechanistic differences between S_N1 and S_N2 reactions as well as the factors that will lead to each reaction.
- 4) Describe the products and mechanism of Elimination reactions (E1 and E2)
- 5) Understand the mechanistic differences between E1 and E2 reactions as well as the factors that will lead to each reaction.

Chapter 8- Alcohols, ethers, and thiols (3/11-3/16)

- 1) Name simple alcohols, ethers and thiols using IUPAC rules and understand the characteristic physical properties of each.
- 2) Understand the reactivities of alcohols, ethers and thiols.
- 3) Understand the basic properties of an epoxide (a special cyclic ether).

Chapter 9- Benzene and its derivatives (3/18-3/23)

- 1) Understand the concept of aromaticity and be able to predict if a compound is aromatic.
- 2) Be able to name simple aromatics using IUPAC rules and predict their physical properties.
- 3) Understand the characteristic reactions of aromatics, particularly electrophilic aromatic substitution.
- 4) Understand the basic mechanism of electrophilic aromatic substitution and how substituents effect the reaction outcome

3/25: exam 2 Chapters 5-9. Homework for chapters 5-9 due at 11:00 AM

Spring break!!!!

Chapter 10-Amines (4/4-4/8)

- 1) Understand the chemical and physical properties of amines and how to name simple amines using IUPAC Nomenclature
- 2) Understand the characteristic reactivities of amines (basic, generally good nucleophiles).

Chapter 11 will be skipped

Chapter 12-Aldehydes and Ketones: (4/11-4/15)

- 1) Understand the chemical and physical properties of aldehydes and ketones and how to name simple aldehydes and ketones using IUPAC Nomenclature.
- 2) Understand the characteristic reactivity of ketones and aldehydes (electrophiles at the C-2 Carbon).
- 3) Describe the difference between adding a strong nucleophile (Grignard reagent) and a weak nucleophile (water) to a aldehyde and ketone.
- 4) Understand what acetals and ketals are and how they relate to carbohydrates.

Chapter 13-Carboxylic acids: (4/18-4/22)

- 1) Understand the chemical and physical properties carboxylic acids and how to name them using IUPAC Nomenclature.
- 2) Understand the characteristic reactivity of carboxylic acids (The OH is acidic, the carbonyl carbon is somewhat electrophilic).

Chapter 14-Functional derivatives of carboxylic acids (through 14.6) (4/25-5/2)

- 1) Know the common derivatives of carboxylic acids and how to name them.
- 2) Understand the characteristic reactions of carbonyl derivatives (electrophiles at Carbonyl carbon)

5/4: exam 3 Chapters 10, 12-14. Homework for chapters 10, 12-14 due at 11:00 AM

Essential Student Information

- compliance with [CSU / SDSU vaccination and facial covering policies](#) is required.
- Your [SDSU email address](#) will be used for all course-related communications.
- The [Student Conduct Code](#) prohibits conduct disruptive to instruction, including academic dishonesty and the unauthorized recording, dissemination, or publication (including on websites or social media) of lectures or other course materials.

- SDSU provides disability-related accommodations via the Student Ability Success Center (sascinfo@sdsu.edu | sdsu.edu/sasc). Please allow 10-14 business days for this process.
- The [Family Educational Rights and Privacy Act](#) (FERPA) mandates the protection of student information, including contact information, grades, and graded assignments. I will not post grades or leave graded assignments in public places. Students will be notified at the time of an assignment if copies of student work will be retained beyond the end of the semester or used as examples for future students or the wider public.
- As an instructor, one of my responsibilities is to help create a safe learning environment on our campus. I am required to share information regarding sexual violence on SDSU's campus with the [Title IX](#) coordinator, Gail Mendez (619-594-6464), who will contact you to let you know about support services at SDSU and possibilities for holding accountable the person who harmed you. If you do not want the Title IX Officer notified, you can speak confidentially SDSU's Sexual Violence Victim Advocate (619-594-0210) or Counseling and Psychological Services (619-594-5220, psycserv@sdsu.edu).
- Class rosters are provided to the instructor with the student's legal name. Please let me know if you would prefer an alternate name and/or gender pronoun.
- Need help finding an advisor, tutor, counselor, emergency economic assistance, or other support? Contact the [SDSU Student Success Help Desk](#) Monday through Friday, 9:00 AM to 4:30 PM.
- For technical or computing assistance, contact the [Library Computing Hub](#).

Academic Honesty:

The University adheres to a strict [policy prohibiting cheating and plagiarism](#), including

- Copying, in part or in whole, from another's test or other examination.
- Obtaining copies of a test, an examination, or other course material without the permission of the instructor.
- Collaborating with another or others in coursework without the permission of the instructor.
- Falsifying records, laboratory work, or other course data.
- Submitting work previously presented in another course, if contrary to the policies of the course.
- Altering or interfering with grading procedures.
- Assisting another student in any of the above.
- Using sources verbatim or paraphrasing without giving proper attribution (this can include phrases, sentences, paragraphs and/or pages of work).
- Copying and pasting work from an online or offline source directly and calling it one's own.
- Using information found from an online or offline source without giving the author credit.
- Replacing words or phrases from another source and inserting one's own words or phrases.

Under CSU policy, instructors must report instances of academic misconduct to the Center for Student Rights and Responsibilities for disciplinary review by the University, which may lead to probation, suspension, or expulsion. Instructors may also, at their discretion, penalize student grades on any assignment or assessment discovered to have been produced in an academically dishonest manner.

If using webcams during exams: During this course, I may require students to use Respondus Lockdown Browser, or to require web-cam use during course sessions. I will notify students in advance of examinations requiring web-cam use. Students who wish to participate in a recorded course session shall be allowed to turn off their webcam.

Extra help and tips for Success

Help is available in a variety of forms.

- Work with your classmates on difficult material.
- Get a tutor. The Chemistry office (GMCS 209) or I can also help you to find one.

- There will be a review session the Thursday before each exam at 5:00 PM.

10 Musts to get a good grade:

- Attend all lectures and labs.
- Read material in book and notes before lecture, prior knowledge will help you become engaged in lecture and better comprehend material.
- Write questions down, and attend office hours.
- Do assigned homework (worth more than an exam!).
- Discuss concepts with classmates, or study partner.
- **Don't fall behind!**
- Try to see the big picture. Organic chemistry builds upon itself. Many of the topics within a chapter are just a slight variation of something you learned.
- Be curious. Always ask why? Curiosity makes a scientist tick.
- Focus on understanding concepts, not memorization.
- Actively read tests and notes... every few minutes you should try a problem.
- With Studying it is quality not quantity. Focus on comprehension not memorization.

Land Acknowledgment

For millennia, the Kumeyaay people have been a part of this land. This land has nourished, healed, protected and embraced them for many generations in a relationship of balance and harmony. As members of the San Diego State University community, we acknowledge this legacy. We promote this balance and harmony. We find inspiration from this land, the land of the Kumeyaay.