

Chem. 130 Elementary Organic Chemistry – *online*

Spring 2021, Schedule number: 20715

Instructor: Prof. B. Mikael Bergdahl

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Course Information

Lecture Meetings: MWF, 11:00-11:50 am (PST). *Recordings on Zoom – posted on Canvas*

Office Hours: MW 1:00-3:00 pm (PST) *and by appointment (Zoom links provided)*

Class Location: *Online via Zoom – unique links will be sent out in advance*

Canvas Course website: <https://sdsu.instructure.com/courses/47679>

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 2nd, 2021. 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 February 2nd, 2021. 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.

Course Overview

Chem 130 covers the fundamental organic chemistry needed for fields related to health and the environment. Chem 130 will prepare students for Chem 160 (biochemistry). A majority of the course material will focus on applications of organic chemistry geared towards biochemistry and important connections found in our world. Organic chemistry (Chem 130) differs from general chemistry in that it focuses on the top row of elements in the periodic table and the halogens (C, H, N, O, F, Cl, Br, I). Since we are living in a 3D-world, the 3-dimensional shape of molecules is particularly important. Chem 130 will also cover fundamental organic transformations and how they are applied to everyday life and biochemistry.

Enrollment Information

Prerequisites: Chem 100. (Note: Other chemistry courses may qualify as a prerequisite. I will consider these and you should see the instructor as soon as possible.)

Course Materials

Required Texts:

- 1) Introduction to organic chemistry by William H Brown and Thomas Poon (Wiley), 6th Edition.
- 2) Students Solutions Manual to Accompany Introduction to Organic Chemistry by Brown, Poon, and Erickson (Wiley), 6th Edition.

Required Equipment: Computer webcam (Zoom) and microphone for exams and office hours. No smart phones.

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

Course Homework: The best way to learn organic chemistry is through doing plenty of problem solving. Roughly 18% of your course grade (150 points scaled based on percentage of HW points received) will be from submitted homework. It is important that you keep up with the homework and do not fall behind. Do not wait until the last minute with submission electronically. You will be informed about the deadline well in advance so no request for extensions of due date and time will be granted.

Lecture Notes: Powerpoint slides will be posted as soon as possible on the Chem 130 Canvas website. The lecture notes cover major topics in the course, **and is not a replacement for coming to class and reading the book!!**

Assigned homework text Problems: In the back of the syllabus there is a list of highly recommended problems from each chapter found in the book. These problems are similar (not identical) to the problems you will face on the exams. The key take-home from organic chemistry is the

understanding of the topics, thus you should never memorize but rather understand and apply yourself. WORK THE PROBLEMS !! Once you have completed the assigned problems you then submit your work (pdf) on the Canvas page, and each chapter submission is worth about 12 points (out of 150).

Course Structure and Conduct

The course will be presented in a traditional lecture 'chalk talk' format using the Zoom platform online. It is imperative you start the post-chapter homework as chapters are covered in lecture. It is also important that you read the text and work the pre-lecture homework before and after lecture so that you are familiar with the material as it is presented. The best advice for this class is to be proactive. Start the homework early, go to my office hours for help, advice or if you feel you are falling behind, and read ahead in the book and notes. *Since the lectures are not pre-recorded but rather recorded in a live streaming format, all questions you might have during lecture have to be answered until the end of lecture, when the floor is open for discussion. This post-lecture "chat" will also be recorded as a continuation of the lectures.* One simple way to actually learn the topic is to ask plenty of questions, and I promise you I will encourage you to ask a lot of questions. One way to be critical of science, and to understand it, is to ask questions.

Attention Examination Protocol via Zoom: **Attention**

1. Log in using the zoom link your instructor sent you prior the exam. You must use your real name and enter a "+" into the chat window to register your attendance.
2. You must appear on camera and your work area must be visible for the whole exam. Dress accordingly, and please put away anything that looks like books or notes etc. You must have a clear work space – you just need something to write with. No calculators, smart watches, nor smart phones are allowed during the exam. **Since we are interested in your work area, and your visible hands, tablets or smart phones are NOT allowed during the test. No exceptions!!** Molecular model kits are allowed, but must be disassembled at the start of the exam.
3. **You will be recorded on Zoom** for the duration of the exam, and you will be visible to other students in gallery view – just as in a real F2F examination room. Do not place your exam paper close to the camera so anyone else can see it.
4. Before you begin the exam, anytime after you join the meeting, show your **RedID** card (DMV card ok) to the camera and hold it there for 10-15 seconds. Your ID card will be recorded so it can be read.
5. Ask questions by private message to your instructor. Private messages between test takers have been disabled.
6. The final exam is 120 minutes in duration, starting exactly at 10:30 am (**PST**), and will posted at that time on Canvas for you to download. You will have 5-10 minutes extra at the end of the exam to scan it as a **pdf-file**, and then upload the file on Canvas. **You must also send your final exam via email to your instructor or TA. Your instructor will let you know when you can exit the zoom exam meeting. If you leave before the exam is uploaded, your exam will be void – No exceptions!** Please include your **RedID** card on every image of your test pages. You can print and write on the exam itself, or use blank or lined paper. As long as your answers are readable, it is all good. In order for the grading to be done quickly, **pdf-type files**, is the only format acceptable.

Best wishes on your exams. Follow **the honor code**, do your absolute best, and make SDSU proud of how our large class worked together to maintain the virtual ochem experience as authentic as possible during a quite tough situation.

Course Assessment and Grading

Exams: There will be three exams during lecture hour (150 points each) and one final (250 points).

Dates: Exam 1: Feb 19. Exam 2: March 19. Exam 3: April 9.

Final Exam: Monday May 10, 10:30-12:30 am

Each midterm exam is one hour, **each worth 150 points**. Each exam consist of 30 multiple choice questions. The two hour Final Exam is cumulative and is worth **250 points** (30 multiple choice questions and 10 short answer questions). If needed, your final exam score can replace your lowest exam score.

Thus, there will be no make-up exams. If you miss an exam, for *any reason,* your final exam percentage will automatically replace it. The final exam is not optional and cannot be dropped. **There will**

be no quizzes. The submitted homework is worth **150 points**. Your final grade will be based on a maximum of 850 points, distributed as follows: Three exams (150 points each), Final Exam (250 points), Submitted Homework (150 points).

Letter Grade Assignment: Depending on class performance the Exams may be curved. If necessary the class average will be curved 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
86%	A-	62%	C-
82%	B+	58%	D+
78%	B	54%	D
72%	B-	50%	D-
70%	C+	<50 %	F

Student Learning Outcomes (broken down by chapter). The included schedule below is tentative and subject to change:

Chapter 1-Covalent bonding and Shapes of molecules

- 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, sp², or sp³
- 8) Identify common functional groups

Chapter 2-Acids and Bases:

- 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:

- 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:

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

Chapter 5-Reactions of alkenes and alkynes:

- 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 alkynes, and alkynes to alkenes.

Chapter 6-Chirality and the handedness of molecules:

- 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:

- 1) Name simple halo-alkanes 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) Predict products and understand 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:

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

Chapter 10-Amines:

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

Chapter 12-Aldehydes and Ketones:

- 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:

- 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):

- 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)

Chapter 18-Amino acids and proteins:

- 1) Understand what an amino acid is and how they come together to form a protein (via the amide bond)
- 2) Be able to identify basic secondary structure features of proteins and that H-bonding largely acts as the glue that holds these features together.

Students with Disabilities

If you are a student with a disability and believe you will need accommodations for this class, it is your responsibility to contact Student Ability Success Center Disability Services at https://newscenter.sdsu.edu/student_affairs/sds/

To avoid any delay in the receipt of your accommodations, you should contact SASC as soon as possible. Please note that accommodations are not retroactive, and that accommodations based upon disability cannot be provided until you have presented your instructor with an accommodation letter from SASC. Your cooperation is appreciated.

Academic Honesty

The University adheres to a strict [policy regarding cheating and plagiarism](http://www.sa.sdsu.edu/srr/conduct1.html). These activities will not be tolerated in this class. Become familiar with the policy (<http://www.sa.sdsu.edu/srr/conduct1.html>). Any cheating or plagiarism will result in failing this class and a disciplinary review by Student Affairs.

Examples of Plagiarism include but are not limited to:

- 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 your own
- Using information you find from an online or offline source without giving the author credit
- Replacing words or phrases from another source and inserting your own words or phrases
- Submitting a piece of work you did for one class to another class

If you have questions on what is plagiarism, please consult the [policy](http://www.sa.sdsu.edu/srr/conduct1.html) (<http://www.sa.sdsu.edu/srr/conduct1.html>) and this [helpful guide from the Library](https://infodome.sdsu.edu/infolit/exploratorium/Standard_5/plagiarism.pdf): (https://infodome.sdsu.edu/infolit/exploratorium/Standard_5/plagiarism.pdf)

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 or I can also help you to find one.

10 Musts to get a good grade:

- Attend lectures.
- Read material in book and notes before lecture, prior knowledge will help you become engaged in lecture and better comprehend material.
- Write questions, and attend office hours.
- Do assigned homework!
- 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. Apply yourself.
- 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.

Chapter Problem Assignments

Highly recommended problems in Chem 130. (These problems can be found either within or at the end of each chapter.) Your submitted answers on Canvas will be graded, 150p max (12 points each chapter).

Chapter 1 (Covalent Bonding and Shapes of Molecules):

1,2,3,4,5,6,7,8,10,11,12,13,14,15,16,22,23,24,25,26,27,28,31,32,35,36,37,39,41,42,44,47,48,50,51,52,53,54,56,57,60

Chapter 2 (Acids and Bases):

1,2,3,4,5,6,7,8,10,11,13,14,15,17,18,19,25,26,27,28,30,31,32

Chapter 3 (Alkanes and Cycloalkanes):

1,2,3,4,5,6,7,8,10,11,12,13,14,15,16,17,18,19,22,23,24,25,27,29,31,32,34,36,38,41,43,46,47

Chapter 4 (Alkenes and Alkynes):

1,2,3,4,5,9,10,11,12,15,16,17,18,21,22,24,28

Chapter 5 (Reactions of Alkenes and Alkynes):

2,3,4,5,6,7,8,11,12,13,14,15,16,17,18,19,21,22,23,24,25,26,27,28,33,38,40

Chapter 6 (Chirality: The Handedness of Molecules):

1,2,3,4,5,6,7,8,9,10,14,15,17,18,19,20,21,22,23,25,26,29,32,33,36

Chapter 7 (Haloalkanes):

1,2,3,4,5,6,7,8,9,11,12,13,14,15,16,17,20,21,22,24,25,26,27,31,32,33,36,38,40,43

Chapter 8 (Alcohols, Ethers, and Thiols):

1,2,3,4,5,7,8,9,10,11,12,13,15,16,18,20,22,23,24,25,28,30,31,32

Chapter 9 (Skip!)

Chapter 10 (Amines):

1,2,3,4,5,6,7,8,10,11,12,14,15,16,17,18,19,20,21,22,25,29,30,31,34

Chapter 11 (Skip!)

Chapter 12 (Aldehydes and Ketones):

1,2,3,4,5,6,8,10,15,16,18,19,20,21,23,24,25,26,34

Chapter 13 (Carboxylic Acids):

1,2,3,5,7,8,9,10,11,12,13,14,15,16,17,20,21,22,23,25,26,27,28,29,33,34,35,36,37,39,40,41

Chapter 14 (Functional Derivatives of Carboxylic Acids, up section 14.6):

1,2,3,5,9,12,13,14

Chapter 18 (Amino Acids and Proteins):

1,2,3,4,8,9,10,11,12,13,14,15,22,23,24,26,29,33,36,37

Lecture and Exam schedule; Chem 130, Spring 2021, Online

Monday	Tuesday	Wednesday	Thursday	Friday
19-Jan <i>MLK-Day</i>	19-Jan	20-Jan <i>Chapter 1 Introduction</i>	21-Jan	22-Jan <i>Ch.1 cont.</i>
25-Jan <i>Ch.1 cont.</i>	26-Jan	27-Jan <i>Ch.1 cont.</i>	28-Jan	29-Jan <i>Chapter 2</i>
01-Feb <i>Ch.2 cont.</i>	02-Feb	03-Feb <i>Ch.2 cont.</i>	04-Feb	05-Feb <i>Chapter 3</i>
08-Feb <i>Ch.3 cont.</i>	09-Feb	10-Feb <i>Ch.3 cont.</i>	11-Feb	12-Feb R&R - Day
15-Feb <i>Chapter 4</i>	16-Feb	17-Feb <i>Ch.4 cont.</i>	18-Feb	19-Feb Midterm Exam 1
22-Feb <i>Ch.4 cont.</i>	23-Feb	24-Feb <i>Chapter 5</i>	25-Feb	26-Feb <i>Ch.5 cont.</i>
01-Mar <i>Ch.5 cont.</i>	02-Mar	03-Mar <i>Chapter 6</i>	04-Mar	05-Mar <i>Ch.6 cont.</i>
08-Mar R&R - Day	09-Mar	10-Mar <i>Ch.6 cont.</i>	11-Mar	12-Mar <i>Chapter 7</i>
15-Mar <i>Ch.7 cont.</i>	16-Mar	17-Mar <i>Ch.7 cont.</i>	18-Mar	19-Mar Midterm Exam 2
22-Mar <i>Chapter 8</i>	23-Mar	24-Mar <i>Ch.8 cont.</i>	25-Mar	26-Mar <i>Ch.8 cont.</i>
29-Mar <i>Chapter 10</i>	30-Mar R&R - Day	31-Mar <i>Holiday</i>	01-Apr	02-Apr <i>Ch.10 cont.</i>
05-Apr <i>Ch.10 cont.</i>	06-Apr	07-Apr <i>Chapter 12</i>	08-Apr	09-Apr Midterm Exam 3
12-Apr <i>Ch.12 cont.</i>	13-Apr	14-Apr <i>Ch.12 cont.</i>	15-Apr R&R - Day	16-Apr <i>Chapter 13</i>
19-Apr <i>Ch.13 cont.</i>	20-Apr	21-Apr <i>Ch.13 cont.</i>	22-Apr	23-Apr <i>Chapter 14</i>
26-Apr <i>Ch.14 cont.</i>	27-Apr	28-Apr <i>Ch.14 cont.</i>	29-Apr	30-Apr <i>Chapter 18</i>
03-May <i>Ch.18 cont.</i>	04-May	05-May <i>Review/Q&A</i>	06-May Last Day of Classes	07-May <i>Final's Week Begins</i>
10-May <i>Final's Week Final Exam</i>	11-May <i>Final's Week</i>	12-May <i>Final's Week</i>	13-May <i>Final's Week</i>	14-May <i>Final's Week</i>

Friday midterm exam dates: 2/19, 3/19, 4/9. Time: 11-11:50 am.

Chemistry 130 Final: Monday May 10, 10:30-12:30 pm

Rest & Recovery days: 2/12, 3/8, 3/30, 4/15