

CHEM 109: Intermediate Organic Chemistry with Biological Applications

Have you ever wondered why roses are red and violets are blue? Why are plastics such a danger to our planet? What happens to your food as it digests? Organic chemistry has the answers! Trillions upon trillions of super small molecules are responsible for the colors that we see, the containers we eat and drink from, and the food we eat. Most of these life-sustaining molecules are organic (have a carbon backbone). Continue your ochem journey and learn the behind-the-scenes magic that make life possible!

Sparkly Unicorn Instructor: **Caitlin Binder, Ph.D.**; cambinde@ucsc.edu

HW Club: TuW 2-3pm via Zoom

Teaching Assistants: **Momo Ramstedt** (iramsted@ucsc.edu) and **Kevin Lofgren** (kclofgre@ucsc.edu) are here to help in office hours and discussion - schedule posted on Canvas.

Course Description: CHEM 109 is the third quarter of the organic chemistry series and builds upon the fundamental principles of organic chemistry students acquired in CHEM 8A/B, including **acid-base chemistry, resonance, and arrow-pushing**. This is a three-unit course and thus includes relatively less material and homework than the five-unit organic chemistry classes at UCSC. The course begins with an overview of the common mechanisms that will be later applied to metabolic processes involving carbohydrates, lipids, and amino acids. Students will be introduced to the connection between these natural processes and medicinal chemistry.

Discussions: Worksheets and/or quizzes are provided to engage students in the material and with each other. Quizzes are similar, if not identical to the previous week's HW. Re-read recent lecture notes and start the most recent HW assignment to gather questions in preparation for section.

- **Sections start 3/29** for an optional (highly encouraged) meet 'n' greet and mechanisms refresher.
- **Starting week 2 (4/5), attendance in your enrolled discussion is required.**
- Email your TA to make other arrangements if you are unable to attend.
- Everyone is permitted one excused absence from discussion and the lowest quiz score is dropped.

Required Materials

- **Textbook Options** - don't buy a new textbook! Email Caitlin if you don't have one of the books below.
 - Klein, D., *Organic Chemistry, 3rd Edition*, Wiley: New York, **2017**.
 - McMurry, J. *Organic Chemistry 8th Edition*, Wiley: New York, **2012**.
 - **The reading for the first 2 weeks of class is provided on Canvas** – PDF of the McMurry & Begley text – Organic Chemistry of Metabolic Pathways
- **Canvas:** All the course materials! HW assignments, keys, practice exams, updated syllabi, and other course materials are on this site. Class announcements, grades, & assessments too.
 - Bring "lecture templates" to every TuTh class
- **GradeScope:** Students upload completed quizzes & exams; linked within Canvas
- **ModelAR, Mechanisms, & Chirality-2** – FREE, highly recommended, & fun! See "Cool Chemistry Apps" on Canvas

Lecture Recordings – available on Canvas in two places...

1. **YuJa:** CHEM 109 Spring '21 channel linked in Canvas
2. **TuTh Class Recordings page** – linked on Canvas homepage 😊

Creating an Inclusive and Safe Classroom Environment - Let's all treat each other (instructors and students) with respect, regardless of GPA, what we look like, how we like to learn, etc. Attendance at all class sessions will make a huge contribution towards a successful learning process, helping you follow the flow of the material as well as staying informed of changes and announcements. If you absolutely have to miss lecture, watch the webcast as soon as they're available to avoid falling behind. Webcasts are not intended to be a regular substitute for lecture.

I truly value your contributions to class in Zoom – raise hand, unmute yourself to talk, chat window, polls. **Your role in this course is to learn the organic chemistry. My role is to learn about you!**

Assignments and Grading Policies

Life happens! Email your TA before the due date if you need an extension on an assignment

- Reading Assignments are given in the lecture schedule. See the 'note on textbooks' at the end of the lecture schedule. Take 15-30 minutes to skim the assignment before that day's lecture for maximum lecture involvement.
- Homework is your most pivotal assignment to aid in your understanding of organic chemistry. Complete your homework in a timely manner to pass and enjoy CHEM 109! **Homework sets are given per lecture on Canvas.** *Homework is not turned in or checked for credit but this will be the focal point in discussion sections and quizzes and inspiration for exams.* HW problems will help you develop a more complete understanding of the concepts presented in lecture.
- Lecture Notes (25%) are uploaded to Canvas weekly (**due Fridays 11:59pm**).
 - Add your personalized class notes to the provided note templates on Canvas
 - Students can miss one week's worth of notes without penalty (lowest grade dropped in Canvas).
- 'Student's Choice' Project (25%) I had several ideas for students to engage with organic chemistry in creative ways but couldn't choose one! Instead, students choose from 4 different projects with deadlines throughout the quarter. Each student chooses one project with deadlines spread throughout the quarter. **Full details on Canvas.**
 - (1) **Concept Map** – relate every-day phenomenon to fundamental chemistry terms – **due week 3, 4/18**
 - (2) **Mechanism Videos** – make a video of your favorite mechanism – **due week 5, 5/2**
 - (3) **Active Site Design** – build a 3D active site for your favorite enzymatic reaction – **due week 7, 5/16**
 - (4) **Cool Chemistry Apps** – create an assignment to accompany a ochem app – **due week 9, 5/28**

Quizzes & exams are uploaded to GradeScope, an online grading tool linked in Canvas. Refer to Canvas for due dates, complete assignment descriptions and instructions, including the **GradeScope Guides for Students**. Complete quizzes & exams directly on a tablet, print the exam, or copy by hand. If you are having issues, email the assignment to your TA.

- Quizzes & Worksheets (25%) are brief assessments of recently presented material to be given in during most discussion sections. The quiz will be available on Canvas during your enrolled discussion section. *Content is similar if not identical to the previous week's homework.* You may use your HW notebook during quizzes. Memorial Day falls on a Monday – we worked it out so each section takes the same number of quizzes! **There are 6-7 quizzes and the lowest quiz score is dropped in Canvas.**
 - **Quiz** = brief, individual assessments
 - **Worksheet** = longer assessments completed & submitted in pairs (2 max)
- The final exam (25%) is **Monday, June 7th, 12 – 3 p.m.** and is cumulative(ish) with a focus on material not covered on the midterm exam. Principles learned earlier in the course are applied by nature of this course. **Students are required to join the 109 Zoom meeting during exam time with cameras on.** Momo and Kevin will have breakout rooms and Caitlin will be in the main session. Please reach out ASAP if you need alternate accommodations. The final will be posted on Canvas with further instructions.

"Leave it to the Worms!" (extra credit) is a sustainability project designed to give context to the natural degradation processes discussed in CHEM 109 in contrast to non-biodegradable materials. Students begin by tracking their garbage, identifying unnecessary waste, and making changes to reduce their trash. There is also a community awareness component to this project, including talking to friends, learning about local resources, and identifying sustainable local businesses. Full project details will be given in Canvas Discussion. *The intention is to make a real difference in our community!*

READING			SCHEDULE	
Dates	McMurry 8	**Klein 3	Class Topic	Lecture No.
3/30	M&B Chapter 1 is on Canvas		Structure – Property Relationships	1
	*M&B 1.1-1.2		Acids & Bases	
4/1	*M&B 1.3-1.4		Mechanisms: Electrophilic Add'n, Nucleophilic Sub.	2
4/6	*M&B 1.5		Mechanisms: Addition to Carbonyl Compounds	3
4/8	*M&B 1.6-1.7		Mechanisms: Nucleophilic Acyl Substitution & Carbonyl Condensation Reactions	4
4/13	*M&B 1.6-1.7		Mechanisms: Elimination & Redox	5
4/15	McMurry 26.1-2	Klein 25.1-25.2	pKa: Polyprotic Acids	5'
4/20	TBD		Cannabis Chemistry	420
4/22	26.3	see note below	Amino Acid Biosynthesis	6
4/27	26.4, 26.9-11	25.7-25.8	Peptides & Enzymes	7
4/29	^	^	Mechanism / Active Site Design	^
5/4	25.1-5, 25.8-9	24.1-24.5, 24.7-24.8	Carbohydrates, Polysaccharides, and Polymers	8
5/6	29.1, 29.5	see note below	Carbohydrate Catabolism: Glycolysis Phase 1	9
5/11	29.5	see note below	Glycolysis Phase 2 & Decarboxylation Intro	10
5/13	29.6	see note below	Fates of Pyruvate	11
5/18	27.1-3,5	26.1-26.3, 26.8	Lipids: Structure, Terpenoid Biosynthesis	12
5/20	28.1-3, 28.7	see note below	Nucleic Acids	13
5/25	#Palleros		Introduction to Medicinal Chemistry	14
5/27	-		β -Lactam Antibiotics: Penicillins & Cephalosporins	15
6/1	-		Morphine Background & Biosynthesis	16
6/3	-		Q&A Session	-
FINAL EXAM - Monday, June 7 th , 12 – 3 p.m. Cumulative(ish), ~50% from Lecture 8-16 Material				
NO MAKE-UPS, NO EXCEPTIONS				

McMurry 8 = *Organic Chemistry 8th Edition* (former 8A/B text)

***M&B** = McMurry & Begley, *The Organic Chemistry of Biological Pathways* - PDF of Chapter 1 on Canvas

****Klein 3** = Klein *Organic Chemistry 3rd Edition* (current 8A/B text)

***Palleros** = PDF posted on Canvas

Note on textbooks: CHEM 109 was developed from the McMurry & Begley text, which went up significantly in price in recent years. Most of this material was in 'McMurry 8' but the new 'Klein 3' text does not contain as much on metabolic processes. Background reading for Klein users for 6, 9-11, and 13 will be posted for students online. **Worry not! The material you need to know is in the lecture notes (templates provided online, full content in lecture).**

Set Yourself Up for Success!

An easy way to make CHEM 109 a more pleasurable experience is to establish good study habits early and stick to them. The learning process is fluid and changes often need be made based on other commitments. Many of these changes can be anticipated or worked around by staying organized.

Follow these points and you can expect to excel in this class:

- **STAY ON TOP OF THE MATERIAL – JOIN US IN CLASS!**
- Do your best to keep a positive attitude toward yourself and your learning process
- Skim the reading assignment and review previous class notes before each lecture
- **Bring lecture blanks to class – designed to help you learn more and write a lil less ☺**
- Review your notes and start HW assignments soon after lecture
- Attend HW Clubs (office hours) & discussion sections
- Re-do HW problems without “cheating” to study for tests **ON YOUR OWN**
- Keep an organized, working record of concepts / problems that are difficult for YOU
- **Practice arrow-pushing for 10+ minutes every day. Play the Mechanisms app!**
- Organize your knowledge using concept maps, flow charts, study sheets, etc.

Before lecture: Check the syllabus for the reading assignment and take *20-45 minutes to skim the assigned text sections*, paying special attention to bold-faced words, **figures**, and example problems. Skim the lecture blanks to get a better idea of what will be specifically covered in class. I do not expect you will understand everything that you read at first, but all will be revealed to your ‘future self’ during lecture!

****Eat breakfast before coming to class****

During lecture: Join the Zoom lecture from Canvas. Please ask questions by unmuting yourself, using the “raise hand” function, or type in the chat window. Momo and/or Kevin will likely be helping with the chat too ☺ Your questions and comments let me know where you are in your process. We will never shame your questions or your answers. Please be **respectful** of your classmate’s contributions to discussions, including **incorrect answers**. There is much to learn from our mistakes. No question is stupid or too small. *There is no need to apologize for asking a question or for giving an incorrect answer!* It can be difficult at times to write and listen so feel free to let me know if things are moving too quickly (just be nice about it please). **Communication is key!** *Bring the lecture blanks or you will likely fall behind in note-taking.*

After lecture/discussion: Put your notes side by side with the text. Re-write, or at least **re-read your notes** while supplementing your class notes with the textbook material on the **same day as lecture**. *Re-writing notes was a game-changer for me in college!* I highly recommend this as a study tool. Re-do problems we did as a class and come to HW Club to talk through it, or otherwise hang out with your classmates and the material. **Begin homework promptly** so you will have time get help if needed.

Stay organized. Secure your lecture notes in a 3-ring binder or an organized folder on your tablet. I recommend keeping your HW in a separate notebook. Keep a calendar with your full schedule – include office hours and discussion schedule as well as important dates (2 week exam warnings are helpful). Set realistic goals for how you’ll manage your time.

Studying for exams: Studying with groups is great, but it has to be in addition to studying alone. Your classmates cannot help you during the exam! Reading your notes and re-doing problems we do as a class is key. **Re-do as many homework problems as you can, as many times as you can. Don’t just look at a problem and say, “I know how to do that.” Actually write it out again.** Keep a record of problems to bring up in discussion or office hours.

Life Hacks: Stay healthy, especially with exercise and sleep. Your basic biological functions require food and water for learning. Be patient with yourself. The above may sound like a lot, but the idea is to *spread out the work evenly to avoid cramming as well as limiting stress and anxiety!* Everyone learns differently. **Try not to compare yourself to others!**

Grade Distribution**A: 90.00-100%; B: 75.00-89.99%; C: 60.00-74.99%****C-: 55.00-59.99%; D: 50.00-54.99%; F < 50%**

Do your best! I typically do not need to curve exams as a typical exam average is 70+%. Plus (+) and minus (-) grades are used in borderline cases based on final exam scores.

Ex. Student with overall grade of 89%... > 90% on final exam earns an A- ... < 90% on final exam earns a B+

Small Group Tutoring (SGT) works to advance educational equity by designing inclusive learning environments outside of the classroom. In SGT, the tutor is an undergraduate student who took the class, did well, and is trained to facilitate group sessions that focus on students' needs to succeed in the course. SGT is offered at least three times each week, starting week 2. SGT is open to all students enrolled in the class. Sign up online through Slug Success (<https://sserc.ucsc.edu/slug-success>) starting **TBD**. When you sign up for SGT, you are committing to attend every week. Tutoring begins **TBD**. Sign-ups close week 8 of the quarter.

Disability Accommodation

UC Santa Cruz is committed to creating an academic environment that supports its diverse student body. If you are a student with a disability who requires accommodations to achieve equal access in this course, **submit your Accommodation Authorization Letter from the Disability Resource Center (DRC) using the form under Canvas Quizzes** – Home Page or Quizzes, preferably within the first two weeks of the quarter. We can set up a time to meet and discuss how to ensure your full participation in the course. *This may also include **scheduling make-up discussions if there are time conflicts due to extended exam times** for other courses.* We encourage all students who may benefit from learning more about DRC services to contact DRC by phone at [831-459-2089](tel:831-459-2089) or by email at drc@ucsc.edu.

Title IX prohibits gender discrimination, including sexual harassment, domestic and dating violence, sexual assault, and stalking. If you have experienced sexual harassment or sexual violence, you can receive confidential support and advocacy at the Campus Advocacy Resources & Education (CARE) Office by calling (831) 502-2273. In addition, Counseling & Psychological Services (CAPS) can provide confidential, counseling support, (831) 459-2628. You can also report gender discrimination directly to the University's Title IX Office, (831) 459-2462. Reports to law enforcement can be made to UCPD, (831) 459-2231 ext. 1. For emergencies call 911.

Faculty and Teaching Assistants are required under the UC Policy on Sexual Violence and Sexual Harassment to inform the Title IX Office should they become aware that you or any other student has experienced sexual violence or sexual harassment.

Land Acknowledgement

"The land on which we [would] gather [if we were meeting in person] is the unceded territory of the Awaswas-speaking Uypi Tribe. The Amah Mutsun Tribal Band, comprised of the descendants of indigenous people taken to missions Santa Cruz and San Juan Bautista during Spanish colonization of the Central Coast, is today working hard to restore traditional stewardship practices on these lands and heal from historical trauma."