

LECTURE SYLLABUS

Course Organic Chemistry II, 32: Lecture and Laboratory
Time and Location Monday through Friday– 1:00-4:00 p.m., Daly Science 206

Lecture Text

The text for the lecture component of this course is optional. The following texts/resources may be useful for you in this course:

1. Virtual Text in Organic Chemistry: <http://www.cem.msu.edu/~reusch/VirtualText/intro1.htm>
2. Any reasonable organic chemistry text, electronic or print form, for lecture preparation by reading about topics to be covered in the subsequent lecture. McMurry (any edition) or texts by Loudon, Ege, Solomons and Wade are also good.

Course Materials

All course materials are posted in our class Google folder that I have shared with you. Please let me know as soon as possible if you did not receive the invite email. You will need to obtain a copy of the two large packets, the Class Packet and the Problems Packet. Both are large documents, which can be printed from our Chem 32 pages or purchased from Copy Craft for about \$15 each (<http://copycraft-ca.com>, 341 Lafayette St, Santa Clara). We will refer to the Class Packet in lecture regularly, so you are expected to bring the Class Packet to every lecture. I will email additional materials as needed, including problem assignments after every lecture.

Laboratory Text and Materials

Required Text: *Laboratory Techniques in Organic Chemistry* by Mohrig, Alberg, Hofmeister, Schatz and Hammond, 4th Edition. You will use this text in Chem 31-33. Other materials for laboratory can be found on Chem 32 Laboratory webpage (<https://sites.google.com/a/scu.edu/organic-chemistry-laboratory/>). You also must bring your safety splash goggles, lab coat and lab notebook to laboratory every day, including the first day your lab section meets.

Laboratory Notebook: You are required to use a notebook that we ordered especially for Chem 31-33, which can be purchased from the Campus Bookstore. The laboratory notebook is black with numbered, quad ruled pages, embossed with "Santa Clara University" from the Scientific Notebook Company Do not purchase other notebooks that could be on sale in the bookstore. **You may use the same notebook as you purchased for Chem 31L.**

Supplements

Molecular model set: This is optional but helpful for visualizing molecules in 3D. and you can purchase from the bookstore. We sell the Darling Model Kits (<http://www.darlingmodels.com/>) but any model kit will suffice.

Instructors

Lecture: Dr. Brian J. McNelis; Email: bmcnelis@scu.edu; Phone: 554-4797
Laboratory: Drs. Ruhland and Gipson

Office Hours Alumni Science 160 M-Th, 4-5 pm; Other times by appointment

Course Objectives

This course will expand your understanding of fundamental principles in organic chemistry and their application to solving chemical problems. Additionally, you will apply the concepts from lecture in the laboratory setting. To do so, this course will meet the following objectives:

1. Communicating chemical information effectively. You will learn both the technical vocabulary used and the clear representation of chemical structures and reaction mechanisms.
2. Relating physical and structural properties of organic molecules with their reactivities. You will learn to identify and compare the molecular features that govern chemical reactivity.

- Predicting the outcomes of chemical reactions. You will learn to think critically in applying central principles of organic chemistry to solve chemical problems in a rational manner.
- Applying chemical principles in the laboratory. You will learn to execute independent experiments that supplement and complement the topics covered in lecture. You will become proficient in essential techniques for the reaction, isolation, and purification of organic compounds, and the proper disposal of waste produced in generating them. You will also learn the proper use and maintenance of a laboratory notebook as a record of your experimental work.

Course Content and Approach

In this second term of the three-course sequence, we will examine a number of spectroscopic methods as a means of identifying organic compounds. A review of infrared spectroscopy followed by a discussion of nuclear magnetic resonance and mass spectrometry will provide us the essential tools for structure determination. A return to our discussions of reactions and mechanism will feature a number of different functional groups and their chemistry. Specifically, alcohols, aldehydes, ketones and carboxylic acids will be investigated. Carboxylic acid derivatives and acyl substitution reactions will also be studied in detail as many of these reactions proceed through the same general mechanism. We will continue the study of nucleophile-electrophile processes by learning about an important carbanion nucleophile, the enolate. As in the previous course, the main objective will be the use of mechanism as a tool in problem solving and to understand organic reactivity and new chemical processes. In addition, spectroscopy will add another challenge in problem solving as we learn to predict structure using the different spectroscopic methods. We will continue to use of email and the Google sites to support the problem solving objectives of this course.

How to be Successful in Organic Chemistry

Educational studies have shown that learning/mastering material early in an organic chemistry course and having a proactive approach to seeking help leads to significantly improved performance. (Szu *et.al. Journal of Chemical Education*, 88, 2011, 1238 and Horowitz *et. al. Journal of the Scholarship of Teaching and Learning*, 13, 2013, 120). My own experience over 25+ years of teaching has shown that students who master fundamental concepts early in the course as the topics are covered perform much better in this class. I have developed a large number of support materials to promote your learning in this class. Development of strong problem-solving skills is a goal of this course and essential to your future success in science and related careers. My goal is for you to succeed to the best of your ability and effort, so I have detailed below the specific behaviors that will help you perform your best in this class.

1. Lecture and Notes

- Come to lecture prepared and attend every lecture.
- Before the lecture, review your notes from the previous class and after class, take 15-20 minutes to review your lecture notes and highlight any topics or concepts you do not understand fully. Reviewing your notes after lecture has been shown to dramatically increase concept retention with a nominal time investment.
- Students' notes often contain errors or there are critical omissions in recording important content. Look for gaps and mistakes and compare your notes with other students in the class; many times I find students are confused with what we covered in-class because their notes are incorrect. Consult my notes and lecture videos on topics that you find challenging or confusing based on your notes.

2. Homework

- Do **all** the assigned problems. I send out a customized problem assignment via email after every lecture so that you are able to do all the assigned problems based on what we have covered. The Class and Problems Packets contain exam-level questions that my colleagues and I wrote and most are previous exam questions. If you can do all the assigned problems independently, you will be successful on the weekly quizzes and the exams. Expect to spend several hours each week working on problems.
- Don't look at the answer key to check your answers!!** The biggest challenge students have in this class is consulting the key too soon, which truncates the learning process. Ideally, you would never look at the answer key yourself; use a friend or Benson tutors to check your answers or use your notes to make

sure your answer is consistent with what we learned in class. If you can't get started on a problem, ask for a hint from the Benson tutors or another student in the class. I often give hints in the problem assignment for this purpose. If you have to look at the key, do so only after you have tried a difficult problem a number of times (try to rework the problem after doing other problems; I found waiting a day would often lead to success on a problem) with the help of your notes.

c. Score yourself on every problem assignment and keep track of the number of correct and incorrect answers. Try to correct wrong answers with the help of your notes. Studying the answers on the key is very counterproductive since it gives you the impression of understanding the solution but without any real learning that would lead you to be able to do a similar problem in the future. An important part of the learning process is to identify errors in your thinking process as you solve problems—ask yourself “why did I get this wrong? What did I forget to consider?” Thinking about problems that challenge you this way will help you improve your problem-solving skills.

3. Seek Assistance

a. Office hours. I am available for posted office hours every week and by appointment if you have schedule conflicts. Bring your solved problems and specific questions about course content.

b. Email. I will answer quick questions by email, but you have to send me a picture of the problem and your solution. I often reply with a picture or a video and I often share those videos with the class.

Grades

Grades will be based on your performance on 2 exams (100 points) and the final exam (200 points). Your grade in laboratory will have a small but possibly significant impact on your overall final grade, possibly to increase or decrease your overall course grade. Unsuccessful completion of the laboratory work is grounds for failure in the course. Final grades will be based on a curve, which reflects your performance relative to the average for the class.

Standards

This course is a prerequisite for Chemistry 33, Organic Chemistry III. A grade of C- or higher in Chem 32 is strongly recommended before taking Chem 33. **Students who receive grades lower than C- are urged to meet with their instructor before considering continuing on to Chemistry 32 or 33.**

Pathways

Chemistry 32 is associated with the Pathway in “Paradigm Shifts & The Nature of Human Knowing”, and it may be associated with other pathways in the future. If you declare a Pathway in these areas, you may use a representative piece of work from this course in the Pathway Portfolio you will complete during your senior year. It is recommended that you keep copies of your work.

Policy on Electronic Devices

Students are encouraged to decide for themselves how to best utilize our lecture time and since I post all my lectures as videos, lectures can be missed without significant content consequences for the student. Given this, there is no reason to come to class and do other work on your laptop or other devices. The use of laptops and other digital devices in class is left to students' discretion, until such use is deemed by me to be distracting (to anyone) or otherwise problematic. However, **it is highly recommended that students take proactive steps to ensure that they do not attempt to multitask during class** and that they strengthen their capacity to monotask when engaging in their college coursework. Studies on the efficacy of multitasking are not ambiguous and it does adversely affect your performance. Research strongly indicates that even “minor” **multitasking (checking messages, email, the web, etc.) is highly correlated with learning less and lower performance in college-level coursework.** Students are advised to read the papers below to decide on how to best utilize in-class time and individual study time:

1. “Media multitaskers pay mental price” Golrick (<https://news.stanford.edu/2009/08/24/multitask-research-study-082409/>)
2. “Multitasking Increases Study Time, Lowers Grades” Poitras (<https://today.uconn.edu/2015/07/multitasking-increases-study-time-lowers-grades/>)

3. "Make it our time: In class multitaskers have lower academic performance" Bellur *et. al.* (<https://www.sciencedirect.com/science/article/pii/S0747563215004677>)
4. "Laptop multitasking hinders classroom learning for both users and nearby peers" by Sana, Weston, & Cepeda (<https://www.sciencedirect.com/science/article/pii/S0360131512002254?via%3Dihub>)
"Mini-multitaskers" by Clay (<https://www.apa.org/monitor/2009/02/multitaskers.aspx>)
5. "The Pen Is Mightier Than the Keyboard: Advantages of Longhand Over Laptop Note Taking" by Mueller and Oppenheimer (<https://journals.sagepub.com/doi/abs/10.1177/0956797614524581>)

Academic Integrity

You are expected to maintain the highest standards of academic integrity in both the lecture and laboratory components of this course. Giving or receiving unauthorized aid in any form will result in course failure. Please see me if you need clarification on what constitutes unauthorized aid in your lecture or laboratory work. In the lecture, you will be asked to sign an academic integrity pledge on all quizzes and exams. The pledge reads: "I am committed to being a person of integrity. I pledge, as a member of the Santa Clara University community, to abide by and uphold the standards of academic integrity contained in the Student Conduct Code." ANY use of cell phones or other electronics during exams will be considered a breach of academic integrity and will result in sanctions including course failure.

Exam Policies

Prior to exams or quizzes, it is **your** responsibility to ensure that any course materials, such as class notes or study sheets, are stowed completely out of view. The instructor will supply all of the allowed materials for each exam or quiz (except for a calculator or an optional model kit). Using your own scratch paper is not permitted. If the instructor sees any resources that are not allowed you will be subject to academic integrity sanctions, which can include course failure. Phones must be turned off, put away and not accessed during the exam.

It is expected that you will remain in the classroom during the entirety of the exam/quiz; use the restroom prior to the exam. If using the restroom is unavoidable, all of your testing materials and electronic resources (phone, Apple watch etc.) must remain in the classroom and you must ask the instructor's permission to take a brief restroom break. Taking materials/electronics with you to the restroom is a breach of academic integrity and will result in sanctions including course failure.

Standards

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Disability Accommodation Policy

If you have a documented disability for which accommodations may be required in this class, please contact Disabilities Resources, Benson 216, www.scu.edu/disabilities, as soon as possible to discuss your needs and register for accommodations with the University. If you have already arranged accommodations through Disabilities Resources, please initiate a conversation with me about your accommodations during my office hours within the first two weeks of class. Accommodations will only be provided after I have verification of your accommodations as approved by Disabilities Resources, and with sufficient lead time for me to arrange testing or other accommodations. For more information you may contact Disabilities Resources at 408-554-4109.

Accommodations for Pregnancy and Parenting

In alignment with Title IX of the Education Amendments of 1972, and with the California Education Code, Section 66281.7, Santa Clara University provides reasonable accommodations to students who are pregnant, have recently experienced childbirth, and/or have medical needs related to childbirth. Pregnant and parenting students can often arrange accommodations by working directly with their instructors, supervisors, or departments. Alternatively, a pregnant or parenting student experiencing related medical conditions may request accommodations through Disability Resources, as detailed in the section above.

Discrimination and Sexual Misconduct (Title IX)

Santa Clara University upholds a zero-tolerance policy for discrimination, harassment and sexual misconduct. If you (or someone you know) have experienced discrimination or harassment, including sexual assault, domestic/dating violence, or stalking, I encourage you to tell someone promptly. For more information, please consult the University's Gender-Based Discrimination and Sexual Misconduct Policy at <http://bit.ly/2ce1hBb> or contact the University's EEO and Title IX Coordinator, Belinda Guthrie, at [408-554-3043](tel:408-554-3043), bguthrie@scu.edu. Reports may be submitted online through <https://www.scu.edu/osl/report/> or anonymously through Ethicspoint <https://www.scu.edu/hr/quick-links/ethicspoint/>

In-Class Recordings

The Student Conduct Code (p. 13) prohibits students from “(m)aking a video recording, audio recording, or streaming audio/video of private, non-public conversations and/or meetings, inclusive of the classroom setting, without the knowledge and consent of all recorded parties,” except in cases of approved disability accommodations. The Student Conduct Code also prohibits the “falsification or misuse, including non-authentic, altered, or fraudulent misuse, of University records, permits, documents, communication equipment, or identification cards and government-issued documents.” Dissemination or sharing of any classroom recording without the permission of the instructor would be considered “misuse” and, therefore, prohibited. Violations of these policies may result in disciplinary action by the University. At the instructor’s discretion, violations may also have an adverse effect on the student’s grade.

Wellness Statement

Santa Clara University is a Jesuit Institution wherein the value of cura personalis, translated to care for the whole person, holds a place of incredibly high importance. Caring for oneself in both a physical and mental sense is paramount to a student’s ability to live an enjoyable life at Santa Clara University, excel in academia, and reach their full potential in all aspects of their personhood.

- Students should always strive to get an appropriate amount of sleep each night; the recommended amount of sleep for adults ages 18-25 is 7-9 hours.
- Visit the Wellness Center’s (currently located at 852 Market Street) website to see what resources are available on campus to aid and promote student well-being at <https://www.scu.edu/wellness/>.
- Students are given six free counseling sessions with Counseling and Psychological Services — it is highly encouraged you utilize these sessions should you find yourself in need of someone to talk to about anything at all. The number to make an appointment with CAPS is (408) 554-4501. Visit the Counseling and Psychological Services website to learn more about these sessions and more at <https://www.scu.edu/cowell/caps/>.
- If you are sick, please check in with your professor regarding your ability to attend class or lack thereof. By continuing to attend class while feeling sick, you are not only harming your own health, but likely the health of those around you as well. If you are feeling ill, we advise you visit Cowell Health Center during the operating hours of 8:30 am to 5:00pm, Monday through Friday. Visit the Cowell’s center website to learn more about the various services this health center provides at <https://www.scu.edu/cowell/>.

CLASS SCHEDULE

<u>DAY</u>	<u>DATE</u>	<u>TOPIC</u>
M	July 8	Infrared Spectroscopy-Review and Advanced Topics,

		Intro to Nuclear Magnetic Resonance Spectroscopy
T	July 9	NMR Spectroscopy, Mass Spectrometry
W	July 10	Structure Determination using IR, NMR and MS: Alcohols, Diols and Ethers
Th	July 11	Alcohols, Diols and Ethers
F	July 12	EXAM 1 , Aldehydes and Ketones
M	July 15	Aldehydes and Ketones
T	July 16	Aldehydes and Ketones
W	July 17	Carboxylic Acids and Derivatives-Acyl Substitution Rxns
Th	July 18	Carboxylic Acids and Derivatives-Acyl Substitution Rxns
F	July 19	EXAM 2 , Carboxylic Acids and Derivatives-Acyl Substitution Rxns
M	July 22	Carboxylic Acids and Derivatives-Acyl Substitution Rxns
T	July 23	Structural Effects in Acidity – Formation of Enols and Enolates; Kinetic vs. Thermodynamic Bases
W	July 24	Enols & Enolates as Nucleophiles-Alkylation and Related Reactions
Th	July 25	Review and Problems
F	July 26	FINAL EXAM 1-4 pm

Note: The Final Exam will only be given at the designated time.