Contact Information

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I am available to answer questions and assist you with working through problems and strategizing for maximizing your success in the course. If my scheduled office hours do not work for you, please do not hesitate to contact me so that we can arrange for an alternate time. Chemistry is an unavoidably challenging subject, but my aim as an instructor is to make sure that you have the tools you need to rise to the challenge.

Meeting Times

Course Record Number: 34851
Lecture: Tue/Thu 12:30 to 1:45 pm in G7
Lab: Tue/Thu 8:30 to 11:20 am in SC2210
Office Hours:

- Tue/Thu 2:00 to 3:20 pm in SC1222 or SC2210 (or on Zoom by request)
- Fri 1:30 to 2:20 pm in SC1222 or SC2204 (or on Zoom by request)
- Otherwise by appointment

Overview

Course Description: Chemistry 12B is the second of a three-quarter organic chemistry sequence for life and physical science majors. The course expands upon the underlying principles covered in 12A, covering the structure and reactivity of a broad array of functional groups including alkynes, alcohols, ethers, aldehydes, ketones and aromatic compounds. The laboratory portion of the course involves preparation and spectroscopic analysis using a variety of key organic reactions.

Prerequisite: A grade of C or better in Chemistry 12A, or the equivalent.

Course Schedule: See the tentative lecture schedule and lab calendar.

Student Learning Outcomes:

- Construct logical multi-step syntheses for organic molecules
- Use Molecular Orbital theory and Resonance to explain reactions of benzene and other molecules with conjugated π systems
- Increase breadth of knowledge of organic reactions to include functional groups containing oxygen, benzene and more complex π systems
- Construct molecular structures of increasingly complex molecules from IR, ^{1}H NMR, and ^{13}C NMR data

Course Materials

Required

Lecture Text: Klein, *Organic Chemistry, 4th Ed.*,ISBN #9781119745105.

Electronic access can be purchased from the bookstore which includes the e-text, as well as the student solutions manual and other publisher provided resources.

You may also purchase a hard copy of this text, or of the 2nd or 3rd edition, but be aware that the ordering of a few topics has shifted. The 1st edition is not recommended, as it lacks the literature based challenge problems that are one of the book's primary strengths.

Lab Text: Gilbert and Martin, *Experimental Organic Chemistry: A Miniscale and Microscale Approach, 6th Ed.*, ISBN #9781305080461.

Scientific or Graphing Calculator: While this course is not as numerically intensive as the general chemistry series, there will nonetheless be calculations to do here and there.

Lab Notebook: This can be obtained from the bookstore or another source. Duplicate pages are not required, but lab work should be completed in a bound notebook, not on free sheets in a binder.

Safety Goggles: Goggles must form a seal around the sides as well as at the front, and must carry the ANZI Z87 shatter resistance rating.

Combination Lock: This padlock for securing your lab drawer must be a numerical combination lock, not a keyed lock. Students should bring a lock to the lab on the first day of the term.

Disposable Gloves: Gloves should be neoprene or nitrile (not latex), and are available at standard drug stores (CVS, Walgreens, etc.).

Recommended

Lecture Text Solutions Manual: Klein, *Student Study Guide and Solutions Manual, 4e for Organic Chemistry, 4e*, ISBN #9781119659525.

If you are using an earlier edition of the textbook, you should make sure you obtain a solutions manual that matches it.

Organic Molecular Modeling Kit: Any standard model kit will suffice.

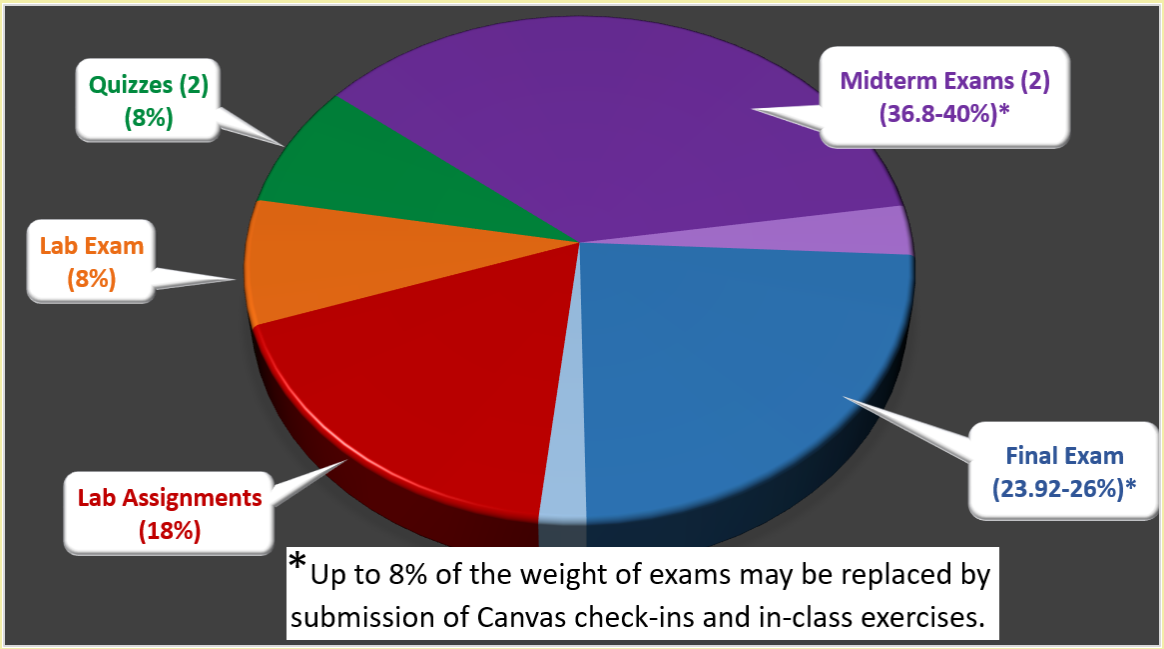
In addition to a physical model set there are many free, open-source software packages for building and visualizing organic molecules. One fairly user-friendly program is Avogadro, which can be downloaded for Mac/Windows/Linux at avogadro.cc .

Lab Coat

Grading Breakdown

General

The general scoring breakdown for the course is shown below, with lecture assessments accounting for 74% of the course grade, and lab related work making up the remaining 26%.



The rough grading scale for the course is shown here:

- >90% = A+/A/A-
- 80-90% = B+/B/B-
- 70-80% = C+/C
- 60-70% = D+/D/D-
- <60% = F

Exams are not curved, however the grading brackets may shift downward (i.e. in your favor) in the final grade calculation to allow for adjustment in the case that the difficulty of some assessments is overtuned in any particular term. The brackets will not, however shift upward (so for instance it is possible that the cutoff for an A- would ultimately shift to 89%, but it will not shift to 91%).

Lecture

Assessments of lecture content will include two quizzes, two midterm exams, and one final exam.

The quizzes (40 points each; tentatively scheduled in weeks 2 and 6), which will serve as checkpoints to ensure that you are keeping up with course content, and not trying to absorb all the material in the days leading up to the exams. It is possible that the dates of these quizzes might shift slightly depending on how course pacing plays out in practice. If the date of a quiz is changed, you will be notified in advance.

The two midterm exams (200 points each) will be held during the laboratory periods on **Thursday, 2/2** and **Thursday, 3/2**. The first exam will cover alkynes, alcohols, ethers, epoxides and sulfur compounds, while the second will focus on aldehydes, ketones and conjugated systems. All exams will of course also require you to draw on your synthetic and structural knowledge from 12A as well.

The final exam (260 points) will be held during the time designated by the college on **Thursday, 3/30 from 11:30 am to 1:30 pm**. While this exam will emphasize material introduced after the second midterm, it is nonetheless unavoidably cumulative in the sense that the study of organic chemistry is essentially the development of a toolbox for understanding organic reactions and devising synthetic pathways. As such, at any point in the series, you will need to be able to draw on the full set of tools that you have accumulated up to that point.

Lab

The majority of the lab component of the course grade will come from completion of the labs themselves, and submission of prelabs, data and typed lab reports. Each lab will be worth a total of 30 points, with 10 coming from the submitted prelab and data pages from your lab notebook, 10 from the typed report, and 10 from attendance and good conduct in lab, including collective proper cleanup when lab is finished. The single lowest overall lab score (prelab + report + attendance) will be dropped, with the remaining 6 labs making up the 180 points associated with lab assignments.

The lab exam (80 points) will account for the remainder of your lab score, and will be held during the lab period on **Thursday, 3/23**. This exam will focus on your understanding of the underlying laboratory and spectroscopic techniques that we have used during the quarter, rather than on the procedural specifics of the exact experiments we performed. In preparing for this exam, you should make sure you understand why we take the steps we do in a given technique, and what the consequences would be if we were to deviate in some way from the correct procedure. This exam will also contain problems related to interpretation of spectra.

Classroom Policies

Attendance

Lecture: This course will adopt a flipped classroom model, where the lecture content is delivered to you via topical videos on Canvas, which you will watch prior to the lecture period. This will free up time in the lecture meetings for working through problems, which is the most important component of building skill in organic chemistry, but which students are often left largely to their own devices to navigate. Brief Canvas check-in assignments worth optional

points that can be substituted for a portion of exams grades will be due prior to lecture to check that you are keeping up with the material.

Attendance in lecture is critical, as this is where we will engage with the broad range of topics covered in the course, and where I will make clear the level of mastery that I will be expecting to see from you when exam time rolls around. While missing lecture will not directly impact your grade if an assessment is not being given, frequent absences will substantially increase the likelihood that you will not perform well on exams. There will also be exercises during lecture that can be submitted for optional points to be substituted for a portion of exam grades, giving you a buffer if you are concerned about your exam performance.

Lab: Unlike a lecture course in which a student can in principle learn the necessary material without being physically present during the lecture period, attendance in lab is a fundamental requirement. In the event that you must miss lab, you must let me know as soon as you are aware of the absence. The first lab absence in the quarter is automatically excused without impacting the student's grade. In the event of a second absence, the student will receive a zero for the relevant lab, or in the case of an excused absence, an alternate assignment related to the lab may be given to make up for the missed period. Three lab absences will result in an automatic failing grade in the course.

Tardy Policy: Proper attendance in lab includes arriving prepared and on time, as important information about safety and proper lab technique will be given at the start of the period. Coming into lab late presents a hazard for your work in the lab, and is disrespectful to your fellow students who work alongside you. For this reason, students will sign in at the beginning of the laboratory period, and the time of sign in will be logged. Signing in more than 5 minutes late to lab will result in a progressive deduction to attendance points, and students arriving more than 15 minutes late will not be allowed to participate in the day's lab activities and will be counted as absent for the day.

Workload

Organic chemistry is a challenging subject, frequently appearing at or near the top of lists of students' most difficult college courses. As such, it is important that you come in with realistic expectations about the amount of time you will need to put in to achieve mastery of the course material. In addition to time spent in lecture and lab, you should be anticipating devoting 6 to 10 additional hours per week to engaging with the course material in a variety of ways, including but not limited to:

- **Watching Lecture Videos Ahead of Lecture:** Since the lecture period will be primarily devoted to problem solving and practice with the material, working your way through the scheduled videos beforehand is a necessity to be prepared for class. It is not necessary that you have a perfect grasp of everything before you arrive to lecture, but you do need to have spent enough time with the material that you are in a position to learn through practice, and to ask questions about topics that you feel need further clarification.
- **Reading the Textbook:** Much of the material covered in organic chemistry is complex, and the details are important. It is difficult to absorb these details in the

context of a lecture and discussion alone. You should therefore make sure to read the relevant sections of the textbook, in addition to watching the lecture videos, in order to help cement your understanding of the material, work through in-text examples and make sure you catch any details that you may have missed.

- **Working Homework Problems:** Working through examples is absolutely essential to developing the facility with organic reactions that is necessary to succeed in the course. As you read through the chapters in the textbook, you should work through all of the in-text problems, as these generally represent a check on basic comprehension of the material presented. Afterward, you can move on to the list of suggested end-of-chapter problems . Note that this list represents the minimum set of problems that you should expect to complete in order to achieve the necessary competency level, and to master the material you should plan on working many additional problems on topics that you find especially challenging. As assessments approach, there will be additional problems to work through, as well as practice exams to give you a sense of what to expect from the actual course exams.
- **Completing Lab Assignments:** Each lab during the quarter includes a written prelab, to be prepared in your notebook and submitted in Canvas before the beginning of the first lab period, as well as a typed postlab report, which will generally be due one week after the last day of the lab. Lab reports submitted after the due date will receive a grade deduction of 20% for each class day that they are late. Late prelab submissions will not be accepted for credit. For detailed information on lab assignments, see the lab assignment guidelines.

Behavior

Lecture Participation: The aim of the lecture period is to aid students as much as possible in grasping the course material. To that end, your participation is critical to ensuring that we make optimal use of the limited time we have together. Answering questions that I ask, and asking questions when you are confused are the best ways to let me know what you do and do not understand yet. If you simply try to passively absorb lecture content without active engagement, you will inevitably find when you try to approach a complex problem on your own, that you are not sufficiently practiced in the kind of reasoning required to find your own path to the end.

Respect for your Peers: The lecture is not only about your learning experience, but also about that of your fellow students. This means that it is important that you be respectful of their time by not engaging in behavior that is disruptive. While you may use electronic devices in class for the purposes of aiding in your own learning process, you may not use them in a way that serves to distract your classmates or otherwise detract from their learning experience. In addition, the classroom is a place where students with diverse backgrounds and identities come together and work toward common learning goals. As we progress in our collective quest to surmount the neverending challenges that chemistry sends our way, we are all entitled to a collegial and supportive learning environment. Any behavior or language that is hostile or demeaning to your fellow classmates is therefore not acceptable classroom behavior (or good general practice as a human).

Proper Lab Stewardship: During the course of the lab, it is inevitable that occasionally accidents will happen, and the accumulation of minor spills, breakages and other events can quickly lead to a lab space that is in general disarray. It is the responsibility of every student in the lab to ensure that care is taken to clean up any messes and ensure that the lab is in good condition for the next class that will use it. A failure to keep the lab clean will result in deductions from the part of the course grade allotted to good lab conduct.

Lab Check-In and Check-Out: You are required to check into a lab drawer at the beginning of the quarter, and check out of it at the end. You are responsible for verifying that all your glassware is present and unbroken at the start of the lab. If you drop the course, you must still arrange a time with your instructor to check out your lab drawer. The stockroom technician will not check out lockers for any students, and not checking out by the end of the quarter will result in an administrative fee and a hold on your registration.

Safety in the Lab

From the American Chemical Society Safety In Academic Laboratories Guidelines, 7th Ed., the following mandatory minimum safety requirements must be followed by all students and be rigorously enforced by all chemistry faculty:

1. **Chemistry Department-approved safety goggles purchased from the De Anza College bookstore (NOT safety glasses) must be worn at all times once laboratory work begins, including when obtaining equipment from the stockroom or removing equipment from student drawers, and may not be removed until all laboratory work has ended and all glassware has been returned to student drawers.**
2. **Shoes that completely enclose the foot are to be worn at all times**; NO sandals, open-toed, or open-topped shoes, or slippers, even with socks on, are to be worn in the lab.
3. Shorts, cut-offs, skirts or pants exposing skin above the ankle, and sleeveless tops may not be worn in the lab: **ankle-length clothing must be worn at all times.**
4. Hair reaching the top of the shoulders must be tied back securely.
5. Loose clothing must be constrained.
6. Wearing "...jewelry such as rings, bracelets, and wristwatches in the laboratory..." should be discouraged to prevent "...chemical seepage in between the jewelry and skin...".
7. Eating, drinking, or applying cosmetics in the laboratory is forbidden at ALL times, including during lab lecture.
8. Use of electronic devices requiring headphones in the laboratory is prohibited at ALL times, including during lab lecture.
9. Students are advised to inform their instructor about any pre-existing medical conditions, such as pregnancy, epilepsy, or diabetes, that they have that might affect their performance.
10. Students are required to know the locations of the eyewash stations, emergency shower, and all exits.
11. Students may not be in the lab without an instructor being present.

12. Students not enrolled in the laboratory class may not be in the lab at any time after the first lab period of each quarter.
13. Except for soapy or clear rinse water from washing glassware, **NO CHEMICALS MAY BE POURED INTO THE SINKS; all remaining chemicals from an experiment must be poured into the waste bottle provided.**
14. Students are required to follow the De Anza College Code of Conduct at all times while in lab: "horseplay", yelling, offensive language, or any behavior that could startle or frighten another student is not allowed during lab.
15. Strongly recommended: Wear nitrile gloves while performing lab work; wear a chemically resistant lab coat or lab apron; wear shoes made of leather or polymeric leather substitute. Reckless behavior will not be tolerated. If your actions endanger the health and safety of yourself or someone else you will be asked to leave and you will receive a zero for the day.

Important Dates

January 21: Last day to add

January 22: Last day to drop without a "W" grade appearing on transcript*

February 2: Midterm Exam 1

March 2: Midterm Exam 2

March 3: Last day to drop classes with a "W"*

March 23: Lab Exam

March 30: Final Exam from 11:30 am to 1:30 pm

* Note that dropping the course in advance of either the drop or withdraw deadline is your responsibility, and you will not simply be dropped because you stopped attending class at some point along the way.

Academic Accommodations

If you have the need for specific accommodations, such as extended-time or reduced-distraction testing, or the use of assistive technology, I am glad to work with you to arrive at an appropriate accommodation arrangement. All such requests must go through Disability Support Programs and Services (DSPS), located in the Advanced Technology Center (AT209). If you need accommodations but are not yet registered through DSPS, please make sure to contact them as soon as possible, as I am not able to provide accommodations without a written notice from that office. The DSPS website is found at www.deanza.edu/dsps .

Academic Integrity

Cheating or plagiarizing in any form will not be tolerated. The first offense of academic dishonesty will result in a zero for the exam or assignment and the offending student will be reported to the Dean of Student Affairs. It is your responsibility to understand what constitutes academic dishonesty (see the academic honor code at www.deanza.edu/policies/academic_integrity.html Links to an external site.).

Note that for the in-class group exercises, you will be working together with your classmates, and it is fine for you to submit work done by the group as a whole, provided you were present and contributed to the group's work. For lab reports, you will generally be sharing data with your fellow classmates, and it is fine to work collaboratively and help one another with understanding how to analyze that data. However, the figures and discussion in the report that you submit must be your own work, and lab reports that have clearly been copied from another student will be assigned a zero score.

Quizzes and exams are meant to assess your own knowledge of the course content, and any consultation with classmates or online or other sources while completing these evaluations will result in a zero score for the relevant assignment and a report being filed with the office of academic affairs.

Tentative Lecture Schedule

Week	Date	Textbook Sections	Lecture Topic
1	1/10	9.1-9.10	Reactions of alkynes (10A-E)
	1/12	9.11, 12.1-12.6, 23.2	Synthetic strategies with alkynes (10F) Preparation of alcohols (11A-D)
2	1/17	12.7, 12.8-12.10, 12.13	Protecting groups and reactions of alcohols (11E-G)
	1/19	13.1-13.8	Preparation and reactions of ethers and epoxides (12A-D) **QUIZ 1 DURING LECTURE PERIOD (PARTS 10 & 11)**
3	1/24	13.11-13.12	Sulfur compounds (12E) Synthesis practice
	1/26		Exam 1 Problem session
4	1/31		Exam 1 Review
	2/2	19.1-19.5	Preparation of aldyhydes and ketones; Acidic and basic carbonyl addition pathways (13A-D) **EXAM 1 DURING LAB PERIOD (PARTS 10, 11 & 12)**
5	2/7	19.6-19.7	Nitrogen nucleophiles and hydrolysis pathways (13E-F)
	2/9	19.8-19.11	Wittig reaction; Baeyer-Villiger oxidation (13G-H)
6	2/14	16.1-16.5, 23.3	Conjugated dienes; Thermodynamic and kinetic control; Molecular orbitals of π-systems (14A-B)
	2/16	16.6-16.10	Pericyclic reactions; Cycloadditions; Diels-Alder Reaction (14C) **QUIZ 2 DURING LECTURE PERIOD (PART 13)**
7	2/21	16.1-16.5, 23.3	Woodward-Hoffmann Rules; Electrocyclic reactions; Sigmatropic Shifts (14D)
	2/23	16.6-16.10	Exam 2 problem session
8	2/28		Exam 2 Review
	3/2	17.3, 17.5-17.7	Introduction to aromaticity; Structure of benzene; Aromatic heterocycles (15A-C) **EXAM 2 DURING LAB PERIOD (PARTS 13 & 14)**
9	3/7	17.4, 18.1-18.3	Benzene derivatives and Benzylic reactivity (15D-E) Introduction to electrophilic aromatic substitution (16A)
	3/9	18.4-18.9	Electrophilic aromatic substitution pathways; Activating and deactivating groups; Directing effects; Blocking groups (16B-E)
10	3/14	18.10-18.15	Nucleophilic aromatic substitution; Elimination-Addition (16F-H)
	3/16		Comprehensive Synthesis Practice
11	3/21		Final Exam Problem Session
	3/23		Final Exam Review
12	3/30		**FINAL EXAM (CUMULATIVE) – 11:30 AM-1:30 PM**

Lab Calendar

Week	Date	In Lab	Experiment Pages	Report Due
1	1/10	Introduction and Check-In		
	1/12	^{13}C-NMR Spectroscopy Intro to Redox		
2	1/17	Oxidation of an Alcohol (Part A) - **1/2 Miniscale**	Theory: 587-593 Procedure: 593-598	
	1/19	Oxidation of an Alcohol (Part A) - **1/2 Miniscale**		
3	1/24	Oxidation of an Alcohol (Part A) - **1/2 Miniscale**		
	1/26	Introduction to Mass Spectrometry	Theory: 301-307	
4	1/31	Spectroscopy Practice		Oxidation
	2/2	**LECTURE EXAM 1 (PARTS 10, 11 & 12)**		
5	2/7	Reduction of 9-Fluorenone - **1/2 Miniscale**	Theory: 621-624 Procedure: 651-653	Spectroscopy Practice
	2/9	Reduction of 9-Fluorenone - **1/2 Miniscale**		
6	2/14	Grignard Reagent Preparation (Also prepare prelab for Part A) - **1/2 Miniscale**	Theory: 715-719, 725-727 Procedure: 719-721, 728-729	
	2/16	Grignard Reaction (Part A) - **1/2 Miniscale**		Reduction
7	2/21	Grignard Reaction (Part A) - **1/2 Miniscale**		
	2/23	Wittig Reaction (Part A) - **1/3 Miniscale**	Theory: 673-677 Procedure: 678-679	
8	2/28	Wittig Reaction (Part A) - **1/3 Miniscale**		Grignard
	3/2	**LECTURE EXAM 2 (PARTS 13 & 14)**		
9	3/7	Kinetic vs. Thermodynamic Control (Parts A, B, C and E)- **1/5 Miniscale**	Theory: 443-448 Procedure: 448-451	Wittig
	3/9	Kinetic vs. Thermodynamic Control (Parts A, B, C and E)- **1/5 Miniscale**	Theory: 443-448 Procedure: 448-451	
10	3/14	Diels-Alder Reaction (Part A)- **1/5 Miniscale**	Theory: 421-425 Procedure: 426	

	3/16	Lab Exam Review		K/T Control
11	3/21	Diels-Alder Reaction (Part A)- **1/5 Miniscale**		
	3/23	**COMPREHENSIVE LAB EXAM**		
12	3/30	Finals Week – No Lab		Diels-Alder

Student Learning Outcome(s):

*Construct logical multi-step syntheses for organic molecules
*Use Molecular Orbital theory and Resonance to explain reactions of benzene and other molecules with conjugated systems
*Increase breadth of knowledge of organic reactions to include functional groups containing oxygen, benzene and more complex systems
*Construct molecular structures of increasingly complex molecules from IR, 1H NMR, and 13C NMR data

Office Hours:

T,TH	02:00 PM	03:20 PM	In-Person	SC1222
F	01:30 PM	02:20 PM	In-Person	SC1222