Chem 12A/AL: Introduction to Organic Chemistry

https://bcourses.berkeley.edu/courses/1494573

Lectures: Tuesday and Thursday 8:00 - 9:29 AM PT; Lectures will be posted on bCourses (https://bcourses.berkeley.edu/courses/1494573)

Laboratory Lectures: Mondays, 5:00 – 6:00 PM PT; Lectures will be posted on bCourses (https://bcourses.berkeley.edu/courses/1494573)

Lecture Instructor: Professor Alanna Schepartz (schepartz@berkeley,edu); Office Hours: Fridays, 4-5 PM (https://berkeley.zoom.us/j/98651070105?pwd=Nzk0cExsNFFNT2ZHdFFNdGplNVFUdz09)

Laboratory Instructor: Professor Anne Baranger (abaranger@berkeley.edu); Office Hours: 9-10 PM Mondays and 8-9 AM Wednesdays

Administration: The administrative coordinator for the course is Natalie Johnson (njohnson614@berkeley.edu). All questions regarding prerequisites, add/drops, enrollment, etc. should be directed to her.

Head Graduate Student Instructor: Katie Blackford (kblackford@berkeley.edu); Office Hours: Mondays, 4-5 PM

Graduate Student Instructors (to be added):

		Section 211 (Tu, 12-5, 322 Latimer)
		Section 311 (W, 12-5, 322 Latimer)

		Section 312 (W, 12-5 320 Latimer)
		Section 321 (W, 5-10, 322 Latimer)
		Section 411 (Th, 1-6, 322 Latimer)
		Section 412 (Th, 1-6, 320 Latimer)
		Section 511 (Fr, 12-5, 320 Latimer)

GSI Office Hours: Each GSI will post their office hours on bCourses. All GSI office hours are open to all enrolled students – you are not limited to the GSI who teaches your lab section.

Review Sessions by Head GSI Katie: Tuesdays 6:30-8:30 pm. First Session: September 1.

Required Materials (12A/AL):

1. Organic Chemistry 2nd ed by Joel Karty, Cal Berkeley Package, W.W. Norton. The package includes the study guide.
2. Understanding the Principles of Organic Chemistry: A Laboratory Experience by Pedersen and Myers –
3. Molecular Model Kit – you may use any molecular model kit you wish. Several reasonably priced, high-quality kits are available on Amazon.com.
4. Technology for remote course: For exams, problems sets, quizzes, and laboratory reports you need to have either: 1) a tablet to be able to hand draw figures and diagrams on pdf documents, or 2) a printer in order to print out the pdf document, hand write the answer, scan, and upload. A low cost tablet that will work is the: Intuos Creative Pen Tablet Small, Black WACTL4100.

Grades:

300	Midterm Exams (100 points each, drop 1 of 4)
300	Lecture Final Exam
42	Lecture Problem Sets (drop 1 of 8)
100	Laboratory Exam
180	Laboratory Notebook Reports (drop 1 of 11)
20	Laboratory lecture check in (drop 1 of 11)
30	Synthesis of Methyl Diantilis Lab Report
20	Lab Lecture quizzes (Drop 1 of 3)
992	Total

Exam Schedule (Chem 12A):

Exam 1: Thursday, September 17, 8:10 – 9:30 am
Exam 2: Tuesday October 13, 8:10 – 9:30 am
Exam 3: Thursday, November 5, 8:10-9:30 am
Exam 4: Thursday December 3, 8:10-9:30 am
Final Exam: Wednesday, December 18 3:00-6:00 pm

Exam Schedule (Chem 12AL):

Laboratory Exam: Monday, November 24

Absence Policy: Absence from a lecture midterm exam that is accompanied by a note from a medical professional or another acceptable source will be handled in one of two ways, at the full discretion of Professor Schepartz. Either (1) your score on the missed exam will be assigned as the average of your scores on all non-dropped midterm exams, scaled appropriately to the class averages on those exams; or (2) you will be required to take a make-up exam.

Accommodations for Students with Disabilities

If you anticipate or experience any barriers to learning in this course, please feel welcome to discuss your concerns with Professor Schepartz or Professor Baranger. If you have a disability, or think you may have a disability, you can work with the Disabled Students' Program (DSP) to request an official accommodation. The Disabled Students' Program (DSP) is the campus office responsible for authorizing disability-related academic accommodations, in cooperation with the students themselves and their instructors. You can find more information about DSP, including contact information and the application process here: dsp.berkeley.edu.

Course Grades: The table below shows the correlation between your final grade and the total number of points you earn. The point ranges may be lowered slightly when final grades are assigned. Bonus points will be offered from time to time for completing surveys.

Grade	**Point Range** (based on 992 total points)	**Approximate % of total points**
A (A+, A, A-)	843 - 992	85 - 100
B (B+, B, B-)	724 - 842.99..	73 - 84
C (C+, C, C-)	605 - 721.99..	61 - 72
D, F (D+, D, D-, F)	0 - 604.999	0 - 60

Cheating and Plagiarism: Any instance of cheating on an exam, lab report, or problem set or unethical conduct will result in an automatic grade of F, a report to the committee on student conduct, and procedures designed to alert past and future professors about any such incidence. **Don't do it!** If you have a problem of any sort that impacts your performance, contact Professor Schepartz (lecture course) or Professor Baranger (laboratory course), rather than resorting to ill-informed and poorly conceived measures.

Details specific to Chem 12A (lecture):

Chem 12A: Summary of Content

Chem12A provides a comprehensive introduction to the fundamentals of organic chemistry – the chemistry of carbon and its compounds. We will first review electronic structure and bonding. We will then focus on four general topics:

1. Conformation and structure
2. Reaction mechanisms
3. Reactions involving alkenes and alkynes
4. Substitution and elimination reactions

All topics are interrelated. One important objective of Chem 12A is to prepare you for more advanced courses in chemistry and biochemistry. Another is to provide an intellectual foundation that allows you to apply organic chemical principles and methods to problems you encounter in the future.

By the end of the class you should be able to:

1. Predict the 3D dynamic structures of organic molecules.
2. Represent mechanisms of organic reactions with arrows, reaction energy diagrams, and orbitals
3. Identify nucleophiles, electrophiles, and leaving groups in reactions.
4. Predict products, including their regio- and stereoselectivity, based on knowledge of the mechanisms of reactions.
5. Propose multi-step syntheses of organic molecules.
6. Use an understanding of the kinetics and thermodynamics of a reaction, predict how the rates and product compositions are affected by changing the substrate, adding a catalyst, changing the temperature or solvent, etc.

Chem 12A: Approximate Schedule of Lectures

The topics covered in each lecture may change slightly as we move through the semester. The dates of the exams will not change.

Date	CH	Topics	Assessment
8/27	1	Atomic and Molecular Structure	
9/1	2	Three Dimensional Geometry	
9/3	3	Orbital Interactions	
9/8	4	Isomerism 1	PS 1 DUE (CH 1-3)
9/10	4	Isomerism 1	
9/15	5	Isomerism 2	
9/17			EXAM 1 (CH 1-4)
9/22	5	Isomerism 2	
9/24	6	Proton Transfer Reactions	PS 2 DUE (CH 4-5)
9/29	6	Proton Transfer Reactions	
10/1	7	Common Elementary Steps	PS 4 DUE (CH 6)
10/6	7	Common Elementary Steps	
10/8	8	Multi-step Mechanisms	
10/13			EXAM 2 (CH 5-7)
10/15	8	Multi-step Mechanisms	

10/20	9	Nucleophilic Substitution and Elimination 1	PS 5 DUE (CH 7-8)
10/22	9	Nucleophilic Substitution and Elimination 1	
10/27	10	Nucleophilic Substitution and Elimination 2	PS 6 DUE (CH 9)
10/29	10	Nucleophilic Substitution and Elimination 2	
11/3	11	Electrophilic Addition 1	
11/5			EXAM 3 (CH 8-10)
11/10	11	Electrophilic Addition 1	
11/12	12	Electrophilic Addition 2	PS 7 DUE (CH 10-11)
11/17	12	Electrophilic Addition 2	
11/19	13	Synthesis	PS 10 DUE (CH 12)
11/24	14	Conjugation and Aromaticity	
11/26		No class	Happy Thanksgiving!
12/1	14	Conjugation and Aromaticity	
12/3			EXAM 4 (CH 11-14)
12/16			FINAL EXAM (3pm-6pm)

Chem 12A: Assigned Problems: Eight problem sets will be assigned over the course of the semester (6 points each). Some problems will be assigned by the instructor, while others will be assigned from the book. Additional practice problems from the book and other sources will be recommended. Your lowest problem set grade will be dropped when your final grade is calculated.

Details specific to Chem 12L (laboratory):

Chem 12AL: Summary of Content

The laboratory component will provide an introduction to the techniques of experimental organic chemistry, including methods of compound purification, characterization, and structural determination.

Laboratory Experiments

The laboratory experiments will be virtual this semester. For each experiment, you will be provided a link to a Google site that leads you through the experiment with a combination of text, photos, and videos. Because writing experimental procedures and accurately recording observations is an important part of good laboratory technique, you will be expected to write the procedure and record observations as you work through the laboratory experiment. There will be pre-lab and post-lab questions just like if you were physically carrying out the experiment. You will meet with your GSI and other students at the time of your laboratory section and work through the laboratory experiment with the assistance of your GSI and other students.

Laboratory Reports and Quizzes:

1. Lab Lecture quizzes (10 points each): There will be 3 short (10 min) quizzes. Your top 2 scores will be included in the grade calculations.
2. Lab Notebook Reports (18 points each): These will be completed each week, including prelab preparation, data/observations, analysis, and conclusions. You will submit these on Gradescope. There are 11 weeks of experiments, the lowest score will be dropped from grade calculations.
3. Synthesis of Methyl Diantilis Lab Report (30 points): There will be a take-home assignment related to the Synthesis of Methyl Diantilis experiment, in addition to the normal lab notebook report. Details will be provided at a later date.

Laboratory Lecture: The laboratory lectures will be pre-recorded and posted on bcourses. These lectures will focus on the theoretical and practical aspects of the lab experiments. Topics will include the principles underlying important purification methods (including crystallization, extraction, sublimation, distillation, and chromatography) and analysis methods (including measurement of physical properties, thin layer chromatography, HPLC, and spectroscopic characterization). During the synchronous laboratory lecture time (Mondays 5-6), Prof. Baranger

and the GSIs will go over the more complex concepts and answer questions about the pre-lab questions. There will be a short check in after each laboratory lecture due on bcourses (2 points each - drop one of 11 for a total of 20 points)

Laboratory Exam: There will be one laboratory exam. If you are absent from this exam and provide a note from a medical professional or another acceptable source, you will be required to take a make-up exam.

Laboratory Schedule

Week	Lab Lecture Date (Mon)	First Lab Date (Tues)	Lab Experiment
1		8/28	No Experiment this week
2	8/31	9/1	Expt. A: Thin Layer Chromatography (TLC)
3	9/7	9/8	Expt. B: Separation of Organic Compounds Using Liquid-Liquid Extraction
4	9/14	9/15	Expt. C: Column Chromatography (Handout)
5	9/21	9/22	Expt. A-C Finish: Analysis of purity and relative yield from weeks 4 and 5 using HPLC
6	9/28 **Quiz 1**	9/29	Expt. D: Recrystallization and Melting Points: Recrystallization of Adipic and Salicylic Acids
7	10/5	10/6	Expt. E: Benzil reduction

8	10/12	10/13	Expt. F: Nucleophilic Substitution Reactions of Alkyl Halides
9	10/19 **Quiz 2**	10/20	Expt. D, E Finish: Analysis of purity separation of products from Expts D, E by TLC, NMR, and HPLC
10	10/26	10/27	Expt. G: Synthesis of Methyl Diantilis
11	11/2	11/3	Expt. H: Hydration of Alkenes
12	11/9	11/10	Expt. I: Some Chemistry of α-Pinene Oxide
13	11/16 **Quiz 3**	11/17	Review and study for exam
14	11/23 **Lab EXAM**	**-**	**Thanksgiving**
15	12/3	12/4	No Lab