

Chemistry 12A: Introduction to Organic Chemistry (Fall 2019)

Lectures:

Tuesdays and Thursdays, 8:10-9:30 am, 245 Li Ka Shing

Tuesdays, 5:10 – 6:00 pm, 105 Stanley

Lecture and Laboratory Instructor:

Prof. Anne Baranger (abaranger@berkeley.edu)

Office Hours: Monday 2:00-3:00 in Hildebrand Library room 100F and

Thursdays 10-11am in 213 Lewis

Head Graduate Student Instructor:

Anneliese Gest (agest@berkeley.edu)

Graduate Student Instructors:

Michael Daugherty	mcdaugherty@berkeley.edu	Section 211 (Tu, 12-5, 322 Latimer)
Neville Dadina	neville_dadina@berkeley.edu	Section 311 (W, 12-5, 322 Latimer)
Rachel Rohde	rachel_rohde@berkeley.edu	Section 312 (W, 12-5 320 Latimer)
Nathaniel Henning	nhenning@berkeley.edu	Section 321 (W, 5-10, 322 Latimer)
Elizabeth Heafner	liz_heafner@berkeley.edu	Section 411 (Th, 1-6, 322 Latimer)
Jennifer Sowin	jennifersowin@berkeley.edu	Section 412 (Th, 1-6, 320 Latimer)
Wyatt Ochs	wyatt_ochs@berkeley.edu	Section 511 (Fr, 12-5, 320 Latimer)

GSI Office Hours are held in 106 Latimer. All GSI office hours are open to all enrolled students – you are not limited to the GSI who teaches your lab section. A schedule is posted on the class bcourses site.

Review Sessions by Anneliese: Tuesdays 6:30-8:30 pm in 150 Wheeler. First Session: 9/3

Administration: The administrative coordinator for the course is Natalie Johnson

(330 Latimer Hall, 642-8163, njohnson614@berkeley.edu), and questions about prerequisites, add/drops, enrollment, etc. should be directed to her.

Class Web Site: bcourses.berkeley.edu

Materials:

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 – custom edition for this course or the regular edition or online/pdf version is also fine.
3. A laboratory notebook with carbon-copy pages (ISBN: 9780738035871, stocked by the bookstore for Chem 3AL/3BL - check with your GSI for approval if you would like to use a different one)
4. Molecular Model Kit – you can use any molecular model kit you wish: Kits from Duluth on Amazon are a reasonable price and good quality. ***You may bring your model kit to all of the exams.***

Grading:

360	Midterm Exams (120 points each)
300	Lecture Final Exam
48	Lecture Problem Sets (Drop 1 of 9)
100	Laboratory Final Exam
200	Laboratory Notebook Reports (drop 1)
30	Synthesis of Methyl Diantilis Lab Report
21	Lab Lecture activities (Drop 1 of 8)
20	Lab Lecture quizzes (Drop 1 of 3)
33	Lecture in-class problems (Drop 1 of 12)
5	Worksheet in lab
1117	Total

Assigned Problems for Lecture Component of Course:

Assigned problems come in two forms.

- 1) Weekly problem sets (6 points each). These problems will be at a higher level than the SmartWork problems. Some of the problems will be written by the instructor, and others will be assigned from the book. Additional practice problems from the book and other sources will be recommended. There will be a total of 8 lecture problem sets.
- 2) Graded in-class activities in lecture (3 points each). Your top 11 scores will be used to calculate this total.

Exams:

Exam 1: Tuesday, October 1, 8:10 – 9:30 am

Exam 2: Tuesday October 29, 8:10 – 9:30 am

Exam 3: Tuesday, November 26, 8:10-9:30 am

Laboratory Exam: Tuesday, December 3, 5:10-6:00pm

Final Exam: Wednesday, December 18 3:00-6:00 pm

For an excused absence at an Exam, as evidenced by a note from a medical professional or another acceptable source, the missed exam will be handled in one of two ways, at my complete discretion, as follows: (1) Your score on the missed Exam will be assigned as

the average of your scores on the other two Exams, scaled appropriately to the class averages on those other exams; or (2) You will be required to take a make-up Exam.

Laboratory Reports, Quizzes, and Worksheets:

1. Lab Lecture Activities (3 points each): Lab lectures will include a short activity that will be related to recent or current lab lectures and/or lab experiments. The activity may be at any time during the lecture. There will be no makeup activities, but only your top 7 scores will be included in the grade calculations.
2. Lab Lecture quizzes (10 points each): There will be 3 short (10 min) quizzes during lab lecture. The quiz may be at any time during the lecture. There will be no makeup quizzes, but only your top 2 scores will be included in the grade calculations.
3. Lab Notebook Reports (20 points each): These will be completed in lab each week, including prelab preparation, data/observations, analysis, and conclusions. There are 11 weeks of experiments, the lowest score will be dropped from grade calculations.
4. 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.
5. Worksheet completed in first laboratory.

Time Conflict

The Department of Chemistry does not allow time conflicts. If you have scheduled a class that conflicts with the lab and/or lecture of this course, we will not accommodate the conflict. You need to make sure that the other course that allowed the time conflict will accommodate all conflicts including exams. You will need to work with the instructor of the course that allowed the time conflict to arrange these accommodations.

Course Grade

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	Range	Percent
A+, A, A-	949-1117	85–100%
B+, B, B-	815–948	73–84%
C+, C, C-	681–814	61–72%
D+, D, D-, F	0–680	0–60%

General Course Policies:

Cheating and Plagiarism: Any cheating in examinations and any other 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 impinges on your performance*, see Professor Baranger, rather than resorting to ill-informed and poorly conceived measures.

Lecture Component of 12A

This course 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 of these topics are interrelated. An important objective of the course is to provide you with an understanding of organic chemistry to apply to problems you encounter in the future involving organic chemistry.

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 regio and stereoselectivity, based on knowledge of the mechanisms of reactions.
5. Propose multistep 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.

Course Outline: The following topics will be discussed in the order shown below (subject to change). The number of lectures per topic will vary. Topics not found in the text will be inserted when appropriate.

<i>Topic 1</i>	Orbitals, bonding, and structure
<i>Topic 2</i>	Conformational analysis
<i>Topic 3</i>	Stereochemistry
<i>Topic 4</i>	Acid/Base
<i>Topic 5</i>	Substitution and elimination reactions
<i>Topic 6</i>	Electrophilic Addition Reactions of Alkenes and Alkynes
<i>Topic 7</i>	Extended orbital systems

Laboratory Component of 12A

Laboratory Lecture:

These discussions (Tuesdays 5-6 pm) 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).

Laboratory:

The laboratory sections will provide an introduction to the techniques of experimental organic chemistry, including methods of compound purification, characterization, and structural determination. Many of the experiments require that you work in groups of two to four students. It is important to compare your data to those of others and determine whether your findings are consistent with what is expected. Group work requires cooperation and sometimes patience. *Please note that no person in a group is to rush the other group member in order to finish early. If it is determined that this is occurring, the graduate student instructor has the prerogative to excuse the person involved, resulting in a score of 0/20 points for that lab report.*

Laboratory Attendance

Attendance in lab each week is mandatory. Requests for exceptions to this policy (as outlined below) should be emailed to Anneliese Gest (agest@berkeley.edu) with cc's to your GSI.

- Students who will be away from campus on a laboratory date for a sanctioned University event (e.g., university band, play on a university athletic team - not club) must email us at least one week in advance of the planned absence. Upon email notification, a reasonable attempt will be made to arrange participation in an alternate lab section prior to the travel dates.
- Students who have a personal or family emergency and have to travel home or be in the hospital (a signed and stamped doctors note is necessary) should contact us as soon as possible. All reasonable effort to accommodate the student in another laboratory section will be made. Unfortunately, a special individual laboratory experience cannot be arranged and so in the event that they are unable to make up the laboratory in another section, they will forfeit that laboratory grade (there is one dropped lab score included in the grading scheme to accommodate this circumstance).

Laboratory Schedule

Week	Lab Lecture Date (Tues)	First Lab Date (Wed)	Lab Experiment	Procedure
1		8/28	No Lab lecture on Tuesday of this week. Lab Check-in, Safety, and Worksheet	
2	9/3	9/4	Expt. A: Thin Layer Chromatography (TLC)	Pedersen Textbook: p. 241, Expt. 7 Loose-leaf: p. 213, Lab 11 Modifications posted on bCourses
3	9/10	9/11	Expt. B: Separation of Organic Compounds Using Liquid-Liquid Extraction	Handout – posted on bcourses
4	9/17	9/18	Expt. C: Column Chromatography (Handout)	Handout – posted on bcourses
5	9/24 Quiz 1	9/25	Expt. A-C Finish: Analysis of purity and relative yield from weeks 4 and 5 using TLC and HPLC	Handout – posted on bcourses
6	10/1	10/2	Expt. D: Recrystallization and Melting Points: Recrystallization of Adipic and Salicylic Acids	Pedersen Textbook: p. 257, Expt. 5 Loose leaf: p. 207, Lab 10
7	10/8	10/9	Expt. E: Asymmetric catalytic transfer hydrogenation	Handout – posted on bcourses
8	10/15 Quiz 2	10/16	Expt. F: Nucleophilic Substitution Reactions of Alkyl Halides	Pedersen: Textbook: p. 257, Expt. 10 Loose leaf: p. 219, Lab 12
9	10/22	10/23	Expt. D, E Finish: Analysis of purity separation of products from Expts D, E by TLC, NMR, and HPLC	Handout – posted on bcourses
10	10/29	10/30	Expt. G: Synthesis of Methyl Diantilis	Handout – posted on bcourses
11	11/5	11/6	Expt. H: Hydration of Alkenes	Handout – posted on bcourses
12	11/12		No Lab sections – Veteran's day	
13	11/19 Quiz 3	11/20	Expt. I: Some Chemistry of α -Pinene Oxide	Pedersen Textbook: p. 291, Expt. 16 Loose leaf: p. 239, Lab 15
14	11/26	-	Lecture and Tuesday lab only. No lab Wed-Fri (Thanksgiving).	
15	12/3 Exam	12/3 (Tu)	Lab Exam (during lab lecture time), lab checkout (Tues-Fri).	