

# Chemistry 12A Organic Chemistry

Winter 2016

## Instructor:

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- Office hours and location: Tuesday and Thursday from 1:00 – 2:15 pm in the faculty space SC-1 on the second floor.

## Sections:

If you are enrolled in this course, you have a lecture period and a laboratory period. There are two sections of lab:

### CHEM 12A Section 61 (CRN 32209)

- Lecture: T-Th 6:00 – 7:15 pm FOR3
- Lab Lecture: T-Th 2:30 – 3:20 pm SC2210
- Lab: T-Th 3:30 – 5:20 pm SC2210

### CHEM 12A Section 62 (CRN 32210)

- Lecture: T-Th 6:00 – 7:15 pm FOR3
- Lab Lecture: T- Th 7:30 – 8:20 pm SC2210
- Lab: T-Th 8:30 – 10:20 pm SC2210

## Course Content:

This first-quarter class of a three-quarter organic chemistry sequence introduces the student to organic chemistry and lays the foundation for the next two quarters, Chem 12B and Chem 12C. Topics covered include structure and bonding, acids and bases, an introduction to functional groups, conformational analysis, stereochemistry, reaction mechanisms and curved-arrow notation, the chemistry of alkyl halides, alkanes, alkenes and alkynes.

## Lecture Materials:

1. *Organic Chemistry, 2<sup>th</sup> edition* by David Klein (Wiley: 2015; ISBN: 978-1-118-45228-8).
2. *Student study guide and Solutions Manual to accompany Organic Chemistry, 2<sup>th</sup> edition* (Wiley: 2015; ISBN: 978-1-118-64795-0).

3. Molecular modeling set (optional). I like the molecular student set by Molymod.

#### Lab Materials:

- Gilbert, John C. and Martin, Stephen F.; *Experimental Organic Chemistry: A Miniscale and Microscale Approach, 5th edition* (Thomson Brooks/Cole: 2011; ISBN 9781439049143)
- 8.5 x 11 or 6 x 9 permanently bound **laboratory notebook**.
- A scientific calculator that has at least log and exponential functions (will be used in lecture as well).
- Laboratory safety goggles purchased from the De Anza Book Store. Other types of goggles will not be permitted.
- A combination lock.
- Latex or Nitrile Gloves available from the bookstore (optional).

#### Attendance and Conduct:

Attendance during lecture, lab lecture, and all laboratory periods are mandatory. Tardiness and leaving before the lecture or laboratory period has ended will not be tolerated. If you miss lecture, laboratory lecture, or a laboratory period for any reason within the first week of class, you will be dropped from the course. Unexcused absences from lab two or more times will result in an automatic "F" grade for the entire course.

Cell phone use during lab or lecture is not allowed. If you need to answer the phone due to an emergency, please do so outside and un-disruptively. Students who don't comply with this rule will be asked to leave the classroom/lab. Students are responsible for reading and following the Academic Integrity policy outlined in the De Anza College catalog at all times. If a student is caught cheating or plagiarizing at any time on any assignment, exam, or quiz, they will be expelled from the course and will receive a grade of "F." If students are caught assisting in the act of cheating or plagiarizing, they too will receive the same punishment.

#### Dropping the Course:

If you wish to drop the course, this is YOUR responsibility. If you do choose to drop, you must officially check out of your lab locker. Failure to check out of lab by the scheduled check-out date will result in an administrative fee and a block will be placed on your future registration.

#### Course Breakdown and Grading Scale:

The class is worth 770 pts.

- The lecture part of the class is worth 500 pts.

- There are three exams and one final exam. Each lecture exam is worth 100 pts.
- Lecture exams will test your knowledge on materials covered in lecture, and exercises found at the end of the chapter.
- The final exam is comprehensive and worth 150 pts.
- There will be at least three announced quizzes during the quarter.
- Final grades are based on the total points earned and not on the curve.

Lecture	
Exams	3 x 100 = 300 pts
Final Exam	1 x 150 = 150 pts
Quizzes	50 pts
total	500 pts

- The Lab part is worth 270 pts

Lab	
Pre-lab	6 x 5 = 30 pts
Lab report	6 x 20 = 120 pts
Lab Exams	2 x 60 = 120 pts
Total	270 pts

- Grading Scale

Grading Scale			
Grade	Percentage %	Grade	Percentage %
A+	98 - 100	C+	75 - 78
A	92 - 97	C	69 - 74
A-	89 - 91	D+	65 - 68
B+	85 - 88	D	62 - 64
B	82 - 84	D-	59 - 61
B-	79 - 81	F	0 - 58

## Lecture Tentative Schedule:

Week	Day	Sections	Topics	Recommended problems
1	01/05/16	1.1-1.5	Introduction, atomic structure, chemical bonds, Lewis structure and formal charge.	1.34, 1.36-1.39, 1.44, 1.45, 1.48-1.53, 1.63
	01/07/16	1.6-1.10	Atomic orbitals, valence bond theory, quantum mechanics and hybridization.	
2	01/12/16	1.11, 1.12	VSEPR theory, dipole moment and intermolecular forces.	
	01/14/16	2.1-2.10	Molecular representation, functional groups and resonance.	2.39, 2.42, 2.44-2.51, 2.55, 2.63, 2.65-2.67
3	01/19/16	4.1-4.8	Naming alkanes and cycloalkanes. Newman projection and conformational analysis of ethane and butane.	4.39-4.46, 4.48-4.51, 4.53-4.57, 4.59-4.62, 4.64, 4.66, 4.68, 4.69
	01/21/16	4.10-4.14	Cyclohexane and disubstituted cycloalkane	
4	01/26/16		<b>Exam I Chapters 1, 2 and 4</b>	
	01/28/16	5.1-5.5	Stereochemistry, chirality, labeling stereogenic centers and Cahn-Ingold-Prelog system.	5.35, 5.36, 5.38, 5.39, 5.41-5.43, 5.45, 5.46, 5.48, 5.49, 5.51, 5.53, 5.57, 5.58, 5.61, 5.62
5	02/02/16	5.5-5.8	Enantiomers, diastereomers and meso compounds	
	02/04/16	6.1-6.5	Gibbs free energy, enthalpy and entropy. Thermodynamics Vs. Kinetics.	6.20-6.22, 6.25-6.32, 6.36-6.38, 6.44-6.49
6	02/09/16	6.6-6.12	Energy diagrams, transition and intermediate states. Nucleophiles, electrophiles and carbocation rearrangements	
	02/11/16	3.5-3.9	Acids and Bases	3.36-3.39, 3.42-3.52, 3.56, 3.57, 3.60, 3.62
7	02/16/16		<b>Exam II Chapters 5, 6 and 3.</b>	
	02/18/16	7.1-7.9	Substitution Reactions $S_N2$ and $S_N1$	7.36-7.68
8	02/23/16	8.1-8.6	Elimination reactions E1 and E2 and selectivity	8.50-8.69, 8.73-8.79, 8.81
	02/25/16	8.7-8.10	Elimination reactions E1 and E2 and selectivity	
9	03/01/16	9.1-9.7	Alkenes structures and preparation	9.49-9.54, 9.57-9.60, 9.62-9.73, 9.79, 9.81, 9.82
	03/03/16	9.8-9.13	Reactions of Alkenes	
10	03/08/16		<b>Exam III Chapters 7, 8 and 9.</b>	
	03/10/16	11.1-11.7, 11.10	Alkane radical halogenations	11.22-11.24, 11.26, 11.29, 11.31, 11.33, 11.34, 11.36, 11.38, 11.40, 11.41
11	03/15/16	10.1-10.6	Alkynes: structure, properties, nomenclature and preparation	10.35-10.44, 10.46, 10.49, 10.50, 10.53, 10.57, 10.59-10.61
	03/17/16	10.7-10.11	Reactions of alkynes	
12	03/22/16		<b>Final exam from 6:15-8:15 pm (Comprehensive)</b>	

## Lab Schedule

Week	Day	Report due	Theory / Procedure	Technique	Topic
1	01/05/16			2.1-2.4	Introduction/Safety and Check-in
	01/07/16		153-164	2.21	Lab 1 - Acid and Base extractions (Part A) ½ Miniscale
2	01/12/16		153-164	2.29, 2.9-2.10	Lab 1 - Acid and Base extractions (Part B&C)
	01/14/16		94-106	2.17-2.19	Lab 1 - Acid and Base extractions- Recrystallization
3	01/19/16		113-117	2.7-2.8	Lab 1 - Acid and Base extractions- Melting point
	01/21/16		179-188	2.5-2.6	Lab 2- TLC of Analgesics (Plate preparation)
4	01/26/16	Lab 1	179-188	2.23, 2.24	Lab 2- TLC of Analgesics (Plate Development)
	01/28/16				Lab 3: Relative Reactivity of Alkyl Halides (Handout)
5	02/02/16	Lab 2	473-476	2.11, 2.12, 2.22	Lab 4: 2-Chloro-2-Methylbutane: Synthesis ½ Miniscale
	02/04/16		127-145	2.13-2.16, 2.20	Lab 4: 2-Chloro-2-Methylbutane: Synthesis: Distillation
6	02/09/16		237-256		Lab 4: 2-Chloro-2-Methylbutane: IR Spectroscopy
	02/11/16		348-353	2.18	Lab 5: Dehydration of Cyclohexanol: Synthesis Miniscale
7	02/16/16	Lab 4	196-206		Lab 5: Dehydration of Cyclohexanol: Gas Chromatography
	02/18/16		237-256		Lab 5: Dehydration of Cyclohexanol: IR
8	02/23/16		364-378	2.25-2.28	Lab 6: Bromination of (E)-Stilbene: Synthesis ½ Miniscale
	02/25/16	Lab 5	261-297		Lab 6: Bromination of (E)-Stilbene: NMR Spectroscopy
9	03/01/16	Lab 3	261-297		Lab 6: Bromination of (E)-Stilbene: NMR Spectroscopy
	03/03/16		403-406		Lab 7: Synthesis of diphenylacetylene: Synthesis
10	03/08/16	Lab 6	237-256		Lab 7: Synthesis of diphenylacetylene: IR spectroscopy
	03/10/16		297-301		Lab 7: Synthesis of diphenylacetylene: UV spectroscopy
11	03/15/16				TBA
	03/17/16	Lab 7			Check-out/ Notebook due, Lab Exam
12	03/22/16				

### Prelabs:

- Pre-labs should be prepared **before** performing the experiment and signed by the instructor otherwise **you will not be allowed to do the experiment and no credit will be given for the lab report as well as the pre-lab.**
- Each lab procedure preparation is worth 5 pts
- Usually follow the miniscale procedure (unless stated otherwise), and the Lab Notebook section
- In addition to Google, these two web sites are helpful when looking for the MSDS for chemicals: flinnsci.com and fisherSci.com

### Lab Notebook: Please do not include lab lecture notes in your lab notebook.

- If you have not done so already, please skip the first few pages of your notebook for a table of contents.
- Allot the last 10 pages or so in the **BACK** of your notebook for a table of hazards.

Table of Hazards:

Chemical name	Major hazards	Course of action in case a small spill occurred.	Course of action for eye or skin contact.

1. Title of the experiment and the date
2. Your name
3. Purpose: A few sentences outlining what you are trying to do and how you will do it.
4. Reactions and possible side reactions
5. Procedure:

Procedure:	Observations

- Lab notebooks must be written in ink
- All data must be copied directly in the lab notebook.
- Do not use “white-out” in the lab notebook, instead use one line to cross out incorrect data or mistakes.
- Do not copy the procedure from the text book, instead use your own words otherwise it is considered plagiarism.
- Lab notebooks will be checked during lab and will be awarded 1-5 pts depending on completeness.

## **Lab Report Format:**

General instruction for writing lab reports

### **I. Title**

- Number and title of the experiment
- Name
- Date(s) on which the experiment was performed

### **II. Purpose**

This section contains objective of the experiment including the main method used to accomplish the purpose.

### **III. Introduction**

- This section contains background and theory information relevant to the experiment. What is expected to happen?
- Outline all possible reactions including side reactions

### **IV. Procedure**

Reference the lab notebook pages containing the procedure

### **V. Results**

This is where data and calculations are included

- Data could be organized into graphs or tables
- Each graph, table or figure should be labeled and titled properly
- If calculations were performed, show one example only with the correct significant figures and units

### **VI. Discussion**

This is the section where results are interpreted. In other words what were the significance/ meaning of the results?

- Compare obtained results to literature value
- What was the percentage yield
- Explain how and why the results show the purpose was/was not accomplish (how did the results compare to the concept outlined in the Introduction section)
- Possible experimental errors
- There are no failed experiments (explain what could have happened and if possible at which step in the procedure)

### **VII. Conclusion**

- With one to two sentences indicate if the purpose of the experiment was achieved, and list the percent yield of the products.

### **Useful guideline:**

- Lab reports are typed with 1.5 spacing.
- For each section bold-face subheadings
- Do not copy the procedure from the lab textbook, this is plagiarism. Instead use your own words.
- Always use the passive voice (do not use I, he, she, we, us etc.)
  - Example: “0.5 mL of dimethyl maleate was added to the mixture” instead of “I added 0.5 mL of dimethyl maleate to the mixture”
- Always report the amount actually measured (with the appropriate units) and not the amount stated in the procedure
- Always follow the amount of compound with the number of moles (mol) or millimoles (mmol)
  - Example: D-glucose (0.2 g; 0.001 mol) or D-glucose (0.2 g; 1 mmol)
- Yields are not very reproducible. Round off to the closest 1%

### **Lab Rules:**

- OSHA approved safety goggles must be worn at all times
- No food, drinks or smoking are allowed
- Closed toe shoes must be worn. No bare feet or thong sandals are allowed.
- Clothes covering the skin must be worn or a lab coat
- Know the location of fire extinguisher, safety equipment, and the nearest exit
- Do not use broken or cracked glassware
- Always use a brush and dust pan to sweep up broken glassware
- Never taste or smell chemicals
- Avoid contact of chemical with skin. The use of rubber glove is recommended
- Dispose of chemical waste as directed by instructor
- Clean your work area before leaving
- Chemicals should never be taken back to your lab bench. They must be kept in the fume hood in their proper storage containers.
- Never leave a chemical bottle or waste container uncapped
- If a chemical spill occurs, notify the instructor immediately.
- If you come into contact with a chemical, flush the affected area with water immediately for 15 minutes. Depending on the degree of contact with the chemicals and the location



on the body, you may need to do this in the sink or safety shower. When using the safety shower you must remove the clothing over the area that has come into contact with the chemical. The instructor will ask the other students in the class to leave the room for privacy.

- If your clothing or hair catches on fire use the safety shower immediately. If this is not possible “stop-drop and –roll”.
- If you are hurt or think that you have come into contact with a chemical, notify the instructor immediately (or send a lab partner to fetch the instructor) while following proper safety procedure.
- If you are pregnant or think you are pregnant, it is your responsibility to consult with your physician before taking this course and performing the laboratory experiments.
- At the end of the lab session, check out with the instructor and wash your hands

### **Important Points:**

- If you miss the first week of lab, you will be dropped from the course and your locker will be inspected and may be reassigned to another student. You will be held responsible for any broken or missing lab equipment prior to reassignment.
- If you drop the class, it is your responsibility to officially check out of your lab locker. Failure to do so will result in an administrative fee and a block will be placed on your future registration.
- Two or more unexcused absences from lab sessions will result in an automatic grade of “F” for the entire course.
- If the absence was due to a medical or nonmedical emergency, then it will be an excused absence only with written documentation. Make sure to contact the instructor as soon as possible.
- There are no make-up labs. If you did not perform an experiment due to an unexcused absence, your grade for that lab report will be zero. It is your responsibility to learn the theory, and know how to use the chemicals and equipment in the missed experiment.
- If you missed an exam due to an unexcused absence, your grade for that exam will be zero.
- For every two lab reports that are not turned in, your grade will be dropped by one letter grade.
- Do not copy data, calculations or phrases from lab textbook, internet or other students this is considered plagiarism and cheating. Plagiarism will be penalized following De Anza’s policy regarding academic dishonesty and will be reported to the office of Instruction.

- No late reports will be accepted.
- The ringer on all cell phones needs to be turned off during lab period.
- Notify the instructor if you need to leave the lab for any reason.
- Misbehavior in the lecture and lab classroom will not be tolerated. Any student who behaves in an inappropriate manner will be asked to leave the classroom. If that behavior gets repeated a second time, the student will be reported to the Vice President of Instruction for disciplinary action.
- *The instructor reserves the right to modify and adjust the schedule and the grading scale as needed.*

**Additional information:**

If there are any students that need assistance due to a disability, please feel free to discuss with me any needs in private. Also contact, Disability Support Program and Services located in S41 to assist with any needs if verification/documentation of needs is available.

In case of an emergency, we will all evacuate to the emergency assembly area for our classroom. Make sure to carry your belongings with you and stay with the class until I or an official give further directions. Call 911 in case of an emergency. The student health services are also available at 408-949-6109.

Contact the director of human resources at Foothill-De Anza college district, human resources department at 650-949-6109 if you want to make any complaints regarding unlawful discrimination or sexual harassment.