CALIFORNIA STATE POLYTECHNIC UNIVERSITY, POMONA
CHM 4220, Organic Synthesis, Spring 2020

Lecture:	Tues.	4:00–5:50 pm	Room 5-138	Secn 01, CRN 32974
4220L Lab:	Fri.	12:00–5:50 pm	Room 8-341	Secn 01, CRN 32975

Instructors: **Dr. Laurie S. Starkey** Room 4/1-428 Phone: (909) 869-3670
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Office Hours: Bldg. 4, Room 1-428 – on ground floor (not basement), across the hall from the General Chemistry stockroom, **Monday** 1-3 pm & **Tuesday** 9:30-11:30 am (or by appointment)

Textbook & Materials:

Lecture: L. S. Starkey, "Introduction to Strategies for Organic Synthesis, 2nd ed." Wiley, 2018.

Lab: L. M. Harwood & C. J. Moody, "Experimental Organic Chemistry", 2nd Ed., Blackwell Scientific, 1989 (**will be provided**). and

Lab: L. S. Starkey, "Organic Synthesis Experiments Laboratory Manual, CHM 4220L," Revised Spring Quarter 2016. (**will be provided**)

Lab: Students must have GOGGLES, a LAB COAT, and a LABORATORY NOTEBOOK (alternating colored duplicate pages).

Prerequisites: One year of Organic Chemistry (lecture & lab), Quantitative Analysis (CHM 2210/2210L).

Goals of 4220/4220L: Students will learn to prepare, isolate, purify and characterize organic compounds, using modern synthetic methods. After taking this course, students will be better prepared to work independently in an organic chemistry laboratory. In addition, students will develop the skills needed to search the literature, design a synthesis of a target molecule and plan an experimental procedure.

Learning Objectives for 4220 Lecture. On successful completion of this course, students will be able to:

1. Demonstrate ability to use common organic reactions and transformations
   a. reduction reactions
   b. oxidation reactions
   c. other functional group interconversions (FGI: *e.g.*, additions to alkenes, aromatic substitutions)
   d. C–C bond forming reactions (*e.g.,* organometallics, enolates, aldol, Diels-Alder, Wittig)
2. Design a reasonable multistep synthesis of target compounds using advanced strategies
   a. retrosynthetic analysis for various target molecules (based on functional group patterns)
   b. synthetic equivalents of nucleophiles, electrophiles
   c. use of protective groups (for alcohols, amines, carbonyls and carboxylic acids)
   d. control of stereochemistry and asymmetric induction
   e. enantioselective synthesis and analysis of optical purity
   f. recognize commercially available starting materials
   g. search the literature

Grading of 422 Lecture (tentative)			
	100 pts	weekly quizzes (lowest will be dropped)	
	50 pts	homework & problem sets	
	100 pts	midterm exam	**Tuesday, 3/3, 5:00 – 6:00 pm**
	200 pts	final exam	**Tuesday, 5/12, 5:00 – 6:50 pm**
	500 total points		

Organic Synthesis, CHM 4220, Cal Poly Pomona, Dr. Laurie S. Starkey
Tentative Lecture Schedule – Spring 2020

Please refer to relevant chapters (given in bold) in the Starkey textbook,
"Introduction to Strategies for Organic Synthesis, 2nd edition."

1 1/21	Introduction **Ch. 1.1** protective groups **Ch. 1.2** NMR spectroscopy review	**Part I Problems**
2 1/28	Nucleophiles/Electrophiles, Oxidation/reduction rxns **Ch. 2**	**Part II Problems**
3 2/4	synthesis of alcohols **Ch. 3.1** alkyl/aryl halides **Ch. 3.2**	**Practice Problems: 3.1ab, 3.2**
4 2/11	ethers, thiols, amines **Chapter 3.3, 3.4, 3.5**	**Practice Problems: 3.3, 3.5**
5 2/18	alkenes/Wittig reaction **Chapter 3.6** alkynes and alkanes **Chapter 3.7, 3.8**	**Practice Problems: 3.6ab, 3.7, 3.8ab**
6 2/25	aldehydes and ketones **Chapter 3.9** carboxylic acids/derivatives **Chapter 3.10, 3.11**	**Practice Problems: 3.9ab, 3.10, 3.11ab**
7 3/3	**MIDTERM** **Synthetic Toolbox 1 & 2, 1-Functional Group Target Molecules** (protective groups, redox, Nu:/E+, 1-group disconnections)	**Part III Problems**
8 3/10	1,3-dioxygenated FG pattern: aldol, Claisen **Ch. 4.1, 4.2** 1,5-dioxygenated: Michael reaction, Robinson Annulation **Ch. 4.2**	**Practice Problems: 4.1ab, 4.2**
9 3/17	illogical disconnections (Umpolung): 1,2-dioxygenated **Ch. 4.3** 1,4-dioxygenated **Chapter 4.3** 1,6-dioxygenated - Diels-Alder **Chapter 4.3, 6.4**	**Practice Problems: 4.3, 6.4**
10 3/24	**ACS Meeting (Philadelphia)** Guest lecture	**Part IV Problems**
SPRING BREAK MARCH 28 – APRIL 5		
11 4/7	aromatic compounds: Electrophilic Ar. Sub. **Chapter 5.1** diazonium salts, Nu Ar. Substitution **Chapter 5.2, 5.3**	**Practice Problems: 5.1, 5.2** **Part V Problems**
12 4/14	cyclic TMs **Chapter 6.1 – 6.3**	**Part VI Problems**
13 4/21	stereoselectivity & asymmetric synthesis **Chapter 7**	**Practice Problem 7.4** **Part VII Problems**
14 4/28	transition metal-mediated reactions **Chapter 8**	**Practice Problems: 8.1, 8.5** **Part VIII Problems**
15 5/5	Wrap-up & Review	
F 5/12	**FINAL EXAM** **5:00 – 6:50 pm**	