



5055 Santa Teresa Blvd
Gilroy, CA 95023

Course Outline

COURSE: CHEM 12B **DIVISION:** 20 **ALSO LISTED AS:**

TERM EFFECTIVE: Fall 2021

CURRICULUM APPROVAL DATE: 12/14/2021

SHORT TITLE: ORGANIC CHEMISTRY

LONG TITLE: Organic Chemistry

<u>Units</u>	<u>Number of Weeks</u>	<u>Type</u>	<u>Contact Hours/Week</u>	<u>Total Contact Hours</u>
5	18	Lecture:	3	54
		Lab:	6	108
		Other:	0	0
		Total:	9	162

Out of Class Hrs: 108.00

Total Learning Hrs: 270.00

COURSE DESCRIPTION:

This is the second semester of a year-long organic chemistry course designed as a continuation of Chemistry 12A. Topics include nomenclature, stereochemistry, mechanism, reactions, and spectroscopic studies of the various organic functional groups. Lecture and laboratory methods will focus on synthesis, isolation, purification, elucidation and identification of organic structures as well as instrumental methods and data interpretation. (C-ID: CHEM 160S) PREREQUISITE: Chemistry 12A

PREREQUISITES:

Completion of CHEM 12A, as UG, with a grade of C or better.

COREQUISITES:

CREDIT STATUS: D - Credit - Degree Applicable

GRADING MODES

L - Standard Letter Grade

REPEATABILITY: N - Course may not be repeated

SCHEDULE TYPES:

- 02 - Lecture and/or discussion
- 03 - Lecture/Laboratory
- 04 - Laboratory/Studio/Activity
- 04B - Laboratory - LEH 0.75
- 05 - Hybrid
- 71 - Dist. Ed Internet Simultaneous
- 72 - Dist. Ed Internet Delayed
- 73 - Dist. Ed Internet Delayed LAB
- 73B - Dist. Ed Internet LAB-LEH 0.75

STUDENT LEARNING OUTCOMES:

By the end of this course, a student should:

1. Identify and describe the structures, physical/chemical properties, preparation, and nomenclature of the following groups of molecules: alcohols and phenols; aldehydes and ketones; ethers, epoxides, thiols, and sulfides; carboxylic acids and nitriles; acid halides, anhydrides, esters, and amides; amines; carbohydrates; amino acids and peptides; lipids; and nucleic acids.
2. Identify and evaluate the keto-enol tautomerism, reactivity, chemical reactions of enols and enolate ion molecules, and the Aldol and Claisen condensation reactions.
3. Compose schemes for the synthesis of target compounds from a wide array of simple organic starting materials and reagents.
4. Employ laboratory procedures to: i) Characterize organic compounds based on physical/chemical properties including IR, MS, and NMR spectroscopy. ii) Purify organic compounds by methods including recrystallization, solvent extraction, and distillation. iii) Synthesize, derivatize and degrade organic compounds, and characterize their physical/chemical properties. iv) Isolate, purify, and characterize the structures of organic products. v) Examine chemical concepts through peer interaction and written laboratory reports.

COURSE OBJECTIVES:

By the end of this course, a student should:

1. Identify and describe the structures, physical/chemical properties, preparation, and nomenclature of alcohols and phenols, chemical reactions including oxidation and reduction, as well as the spectroscopy of alcohols and phenols.
2. Identify and describe the structures, physical/chemical properties, preparation, and nomenclature of aldehydes and ketones, chemical reactions including nucleophilic addition reactions, as well as the spectroscopy of aldehydes and ketones.
3. Identify and describe the structures, physical/chemical properties, preparation, and nomenclature of ethers, epoxides, thiols and sulfides, chemical reactions including the Williamson ether synthesis, as well as the spectroscopy of ethers, epoxides, thiols and sulfides.
4. Identify and describe the structures, physical/chemical properties, preparation, and nomenclature of carboxylic acids and nitriles, chemical reactions of carboxylic acids and nitriles, as well as the spectroscopy of carboxylic acids and nitriles.
5. Identify and describe the structures, physical/chemical properties, preparation, and nomenclature of acid halides, anhydrides, esters, and amides, chemical reactions including nucleophilic acyl substitution reactions of carboxylic acids and derivatives .
6. Identify and evaluate the keto-enol tautomerism, reactivity, and chemical reactions of enols and enolate ion molecules.
7. Compare and contrast mechanisms of carbonyl condensation reactions including the Aldol and Claisen, intramolecular reactions, as well as using carbonyl condensation reactions in synthesis.
8. Identify and describe the structures, bonding, physical/chemical properties, preparation of amines, chemical reactions, as well as the spectroscopy of amines.
9. Compare and contrast the classification of carbohydrates, D / L configurations, Fischer Projections and stereochemistry of carbohydrates, chemical reactions of carbohydrates, as well as hemiacetal formation.
10. Compose schemes for the synthesis of target compounds from a wide array of simple organic starting materials and reagents.
11. Identify and describe the classification, structures, physical/chemical properties and nomenclature of amino acids, peptides, and sequencing of amino acids, peptides, and proteins.
12. Compare and contrast lipid biomolecules including waxes, fats, oils, soaps, phospholipids, terpenes, and steroids, as well as their structures.
13. Identify and describe the structures of nucleic acids, as well as base pairing, replication, sequencing, and synthesis of DNA.
14. Employ laboratory procedures to: i) Characterize organic compounds based on physical/chemical properties including IR, MS, and NMR spectroscopy. ii) Purify organic compounds by methods including recrystallization, solvent extraction, and distillation. iii) Synthesize, derivatize and degrade organic compounds, and characterize their physical/chemical properties. iv) Isolate, purify, and characterize the structures of organic products. v) Examine chemical concepts through peer interaction and written laboratory reports.

COURSE CONTENT:

Curriculum Approval Date: 12/14/2021

LECTURE CONTENT:

3 Hours

Review of Organic Reactions

6 Hours

Alcohols and Phenols: Grignard reagents

Ethers and Epoxides; Thiols and Sulfides: Williamsen Ether Synthesis, Claisen Rearrangement

9 Hours

Preview of Carbonyl Compounds

Aldehydes and Ketones: Nucleophilic Addition Reactions

8 Hours

Carboxylic Acids and Nitriles

8 Hours

Carboxylic Acid Derivatives and Nucleophilic Acyl Substitution

Carbonyl Alpha-Substitution Reactions

6 Hours

Carbonyl Condensation Reactions

Amines

6 Hours

Biomolecules: Carbohydrates

Biomolecules: Amino Acids, Peptides, and Proteins

6 Hours

Biomolecules: Lipids

Biomolecules: Heterocycles and Nucleic Acids

2 Hours

Final Exam

COURSE CONTENT(CONTINUED):**LAB CONTENT:**

3 Hours

Laboratory Experiment: Locker Check-In and Safety

12 Hours

Laboratory Experiment: Nucleophilic Aromatic Substitution

12 Hours

Laboratory Experiment: Identification of Aldehydes and Ketones

12 Hours

Laboratory Experiment: Oxidation and Reduction

12 Hours

Laboratory Experiment: Preparation of Esters

3 Hours

Lab Exam

12 Hours

Laboratory Experiment: Synthesis of Aspirin

12 Hours

Laboratory Experiment: Multistep Synthesis of Ionones

12 Hours

Laboratory Experiment: DNA Fingerprinting

12 Hours

Synthesis and retrosynthesis of simple organic compounds.

6 Hours

Lab Exam and Locker Check-Out

METHODS OF INSTRUCTION:

Instruction is by lecture, class discussion, lecture demonstration, small group problem solving, laboratory work projects and homework.

OUT OF CLASS ASSIGNMENTS:

Required Outside Hours 78

Assignment Description

Assigned reading, homework, other written assignments

Required Outside Hours 30

Assignment Description

Lab-based projects

METHODS OF EVALUATION:

Writing assignments

Evaluation Percent 25

Evaluation Description

Written Homework

Lab Reports

Other: Extra Credit report on an organic chemistry topic.

Problem-solving assignments

Evaluation Percent 75

Evaluation Description

Homework Problems

Lab Reports

Quizzes

Exams

REPRESENTATIVE TEXTBOOKS:

Organic Chemistry, 4e., Klein, D. R., J. Wiley Publishing, 2020.

ISBN: 9781119745105 (hardcover); 9781119776741 (eText)

Palleros, D. R. Experimental Organic Chemistry. J. Wiley Publishing. ISBN 9780471282501

RECOMMENDED MATERIALS:

Organic Chemistry, 9e., McMurry, J., Cengage Learning Publishing, 2016.

ISBN: 9781305080485 (hardcover); 9780357539361 (eText)

13 Grade Verified by: D. Clark

Study Guide & Solution Manual, 9e., McMurry, S., Brady, A., Cengage Learning Publishing, 2016.
ISBN: 9780840054456
13 Grade Verified by: D. Clark

ARTICULATION and CERTIFICATE INFORMATION

Associate Degree:

GAV B1, effective 201370

GAV B3, effective 201370

CSU GE:

CSU B1, effective 201370

CSU B3, effective 201370

IGETC:

IGETC 5A, effective 201370

IGETC 5C, effective 201370

CSU TRANSFER:

Transferable CSU, effective 201370

Not Transferable

UC TRANSFER:

Transferable UC, effective 201370

Not Transferable

SUPPLEMENTAL DATA:

Basic Skills: N

Classification: Y

Noncredit Category: Y

Cooperative Education:

Program Status: 1 Program Applicable

Special Class Status: N

CAN:

CAN Sequence:

CSU Crosswalk Course Department: CHEM

CSU Crosswalk Course Number: 160S

Prior to College Level: Y

Non Credit Enhanced Funding: N

Funding Agency Code: Y

In-Service: N

Occupational Course: E

Maximum Hours:

Minimum Hours:

Course Control Number: CCC000096753

Sports/Physical Education Course: N

Taxonomy of Program: 190500