GAVILAN COLLEGE
5055 Santa Teresa Blvd
Gilroy, CA 95023

Course Outline

COURSE: CHEM 12B DIVISION: 10 ALSO LISTED AS:

TERM EFFECTIVE: Fall 2021 CURRICULUM APPROVAL DATE: 12/14/2021

SHORT TITLE: ORGANIC CHEMISTRY

LONG TITLE: Organic Chemistry

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

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.

CONTENT, STUDENT PERFORMANCE OBJECTIVES, OUT-OF-CLASS ASSIGNMENTS

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

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

UC TRANSFER:

Transferable UC, effective 201370

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