GAVILAN COLLEGE
5055 Santa Teresa Blvd
Gilroy, CA 95023

Course Outline

COURSE: CHEM 12A 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 first semester of a year-long organic chemistry course designed for chemistry majors, pre-professional medical, biology, and science majors. Topics include nomenclature, stereochemistry, mechanisms, reactions and spectroscopic studies of organic compounds. 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 150, CHEM 160S) PREREQUISITE: Chemistry 1B

PREREQUISITES:

Completion of CHEM 1B, 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. Describe and apply the concepts and theories on the structure and bonding in organic molecules, as well as the naming, interpretation and drawing of chemical structures.
2. Describe and analyze the stereochemistry of organic molecules, chirality, optical activity, specific rotation, and stereoisomers.
3. Compare and contrast the structures, physical/chemical properties, preparation, and nomenclature of the following groups: alkanes and cycloalkanes; alkenes and cycloalkenes; alkynes.
4. Interpret how organic reactions occur through mechanistic diagrams, as well as describing organic reaction variates, equilibrium, energy, transition states, and intermediates.
5. Describe synthesis reactions involving addition, elimination, substitution, oxidation and reduction.

COURSE OBJECTIVES:

By the end of this course, a student should:

1. Describe and apply the concepts and theories on the structure and bonding in organic molecules, as well as the naming, interpretation, and drawing of chemical structures.
2. Describe and analyze the stereochemistry of organic molecules, chirality, optical activity, specific rotation, and stereoisomers.
3. Describe Fischer Projections and the assignment of configuration, the stereochemistry of reactions resulting from addition reactions to alkenes and chiral alkenes, as well as chirality in atoms other than carbon.
4. Identify and evaluate polar bonds and their consequence in organic molecules, as well as the theories behind acid-base reactions.
5. Interpret how organic reactions occur through mechanistic diagrams, as well as describing organic reaction variates, equilibrium, energy, transition states, and intermediates.
6. Compare and contrast the structures, physical/chemical properties, preparation, and nomenclature of alkanes and cycloalkanes including isomers, stability, and conformers.
7. Compare and contrast the structures, physical/chemical properties, preparation, and nomenclature of alkenes and cycloalkenes including unsaturation, electronic structure, and isomers.
8. Compare and contrast the structures, physical/chemical properties, preparation, and nomenclature of alkynes including unsaturation, electronic structure, and isomers.
9. Describe alkene reactions and synthesis including addition, elimination, oxidation and reduction, as well as carbocation structure and rearrangement.
10. Describe alkyne reactions and synthesis including addition, elimination, oxidation and reduction, as well as introduction to organic synthesis.

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

Curriculum Approval Date: 12/14/2021

LECTURE CONTENT:

6 Hours

Structure and Bonding: atomic structure, orbitals and electron configuration, chemical bonding theory, molecular orbital theories, acids and bases, pKa

Polar Bonds: electronegativity, dipole moment, formal charges, resonance forms

6 Hours

Organic Compounds: alkanes and cycloalkanes, isomerism, functional groups, stereochemistry

6 Hours

An Overview of Organic Reactions: mechanisms, radical reactions

Alkenes: structure, reactivity, electrophilic addition

6 Hours

Alkenes and Alkynes: Reactions and Synthesis

6 Hours

Stereochemistry: enantiomers, chirality, diastereomers, Fischer projections

Alkyl Halides: structure and naming, radical halogenation

6 Hours

Reactions of Alkyl Halides: nucleophilic substitutions and eliminations (SN2 and SN1, E1 and E2)

Structure Determination: mass spectrometry and infrared spectroscopy

6 Hours

Nuclear Magnetic Resonance Spectroscopy: NMR absorptions. Carbon-13 and Hydrogen-1 NMR

4 Hours

Conjugated Dienes and UV Spectroscopy: Diels-Alder cycloadditon reaction

6 Hours

Benzene and Aromaticity: Friedel-Crafts reaction

2 Hours

Final Exam

LAB CONTENT:

9 Hours

Recrystallization and Melting Point

9 Hours

Extraction of Alkanes and Cycloalkanes

12 Hours

Separation and Purification of Organic Liquids, Gas Chromatography

9 Hours

Thin-Layer Chromatography (TLC)

3 Hours

Lab Exam

9 Hours

Refractometry and Polarimetry, Alcohols and Alkenes

12 Hours

Alkyl Halides, Acid-Base Extraction

12 Hours

Nuclear Magnetic Resonance Spectroscopy

12 Hours

Diels-Alder cycloadditon

9 Hours
Electrophilic Aromatic Substitution
9 Hours
Spectroscopy of aromatic compounds, Friedel-Crafts acylation
3 Hours
Lab Exam

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. Hyslop, , 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: 150
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: CCC000251859
Sports/Physical Education Course: N
Taxonomy of Program: 190500