CHEM-2310: ORGANIC CHEMISTRY II

Cuyahoga Community College

Viewing: CHEM-2310 : Organic Chemistry II

Board of Trustees:
2015-05-28

Academic Term:
Fall 2020

Subject Code
CHEM - Chemistry

Course Number:
2310

Title:
Organic Chemistry II

Catalog Description:
Continuation of Organic Chemistry I. Common functional groups with emphasis on aromatic and carbonyl containing molecules, and selected topics such as heterocyclic compounds, macromolecules, and biomolecules introduced.

Credit Hour(s):
5

Lecture Hour(s):
3

Lab Hour(s):
6

Other Hour(s):
0

Requisites

Prerequisite and Corequisite
CHEM-2300 Organic Chemistry I.

Outcomes

Course Outcome(s):
Apply the mechanics of Organic Chemistry reactions to the synthesis of hydrocarbon molecules of biological, pharmacological, and industrial relevance.

Essential Learning Outcome Mapping:
Critical/Creative Thinking: Analyze, evaluate, and synthesize information in order to consider problems/ideas and transform them in innovative or imaginative ways.

Objective(s):
1. Use carbonyl addition reactions to design complex organic molecule synthesis.
2. Utilize various chemical reactions in the solution of complex synthetic problems.
3. Use organometallic reagents to create large complex molecules.
4. Apply the basic reactions and mechanisms of alcohols, diols, amines, carboxylic acids and carboxylic acid derivatives.
5. Determine the structure and reactions of heteroatoms in cyclic organic compounds.
6. Apply oxidation-reduction processes to organic molecules.

Course Outcome(s):
Correlate the fundamental properties of atoms, molecules, ions and bonding with the reactivity of Organic Chemistry molecules.

Essential Learning Outcome Mapping:

Critical/Creative Thinking: Analyze, evaluate, and synthesize information in order to consider problems/ideas and transform them in innovative or imaginative ways.

Objective(s):

1. Use 1H-NMR, 13C-NMR, MS and IR to identify organic substances.
2. Use carbonyl addition reactions to design complex organic molecule synthesis.
3. Utilize various chemical reactions in the solution of complex synthetic problems.
4. Apply the basic reactions and mechanisms of alcohols, diols, amines, carboxylic acids and carboxylic acid derivatives.
5. Use the systematic IUPAC nomenclature to identify multi-functional organic compounds.
6. Determine the structure and reactions of heteroatoms in cyclic organic compounds.
7. Apply oxidation-reduction processes to organic molecules.
8. Know the need for safety in the organic chemical laboratory.
9. Carry out the various laboratory techniques and use lab instruments to characterize organic compounds.

Course Outcome(s):

Interpret experimental laboratory data for presentation as results.

Essential Learning Outcome Mapping:

Critical/Creative Thinking: Analyze, evaluate, and synthesize information in order to consider problems/ideas and transform them in innovative or imaginative ways.
Written Communication: Demonstrate effective written communication for an intended audience that follows genre/disciplinary conventions that reflect clarity, organization, and editing skills.

Objective(s):

1. Use 1H-NMR, 13C-NMR, MS and IR to identify organic substances.
2. Carry out the various laboratory techniques and use lab instruments to characterize organic compounds.

Course Outcome(s):

Write structured, concise lab reports with factual reporting of student results and methodology utilized, which can be applied to repeat the experiment with a similar outcome.

Essential Learning Outcome Mapping:

Written Communication: Demonstrate effective written communication for an intended audience that follows genre/disciplinary conventions that reflect clarity, organization, and editing skills.

Objective(s):

1. Know the need for safety in the organic chemical laboratory.
2. Carry out the various laboratory techniques and use lab instruments to characterize organic compounds.

Course Outcome(s):

Adapt understanding of Organic Chemistry and laboratory skills to novel synthetic challenges.

Essential Learning Outcome Mapping:

Critical/Creative Thinking: Analyze, evaluate, and synthesize information in order to consider problems/ideas and transform them in innovative or imaginative ways.

Objective(s):

1. Use carbonyl addition reactions to design complex organic molecule synthesis.
2. Utilize various chemical reactions in the solution of complex synthetic problems.
3. Use organometallic reagents to create large complex molecules.
4. Apply the basic reactions and mechanisms of alcohols, diols, amines, carboxylic acids and carboxylic acid derivatives.
5. Use the systematic IUPAC nomenclature to identify multi-functional organic compounds.
6. Determine the structure and reactions of heteroatoms in cyclic organic compounds.

Methods of Evaluation:

1. Lecture written examinations
2. Lecture quizzes/homework
3. Laboratory reports on lab experiments and procedures

4. Laboratory tests/quizzes
5. American Chemical Society - Organic Chemistry Exam for Full-year (Comprehensive Exam)

Course Content Outline:

1. Alcohols and Phenols
   a. Structure and Properties
   b. Acidity
   c. Preparation
   d. Reactions of Alcohols and Phenols
2. Ethers and Epoxides; Thiols and Sulfides
   a. Introduction and Nomenclature
   b. Structure and Properties
   c. Preparation
   d. Reactions
   e. Synthetic Strategies
3. Spectroscopy
   a. Infrared Spectroscopy
   b. Mass Spectrometry
   c. Nuclear Magnetic Resonance Spectroscopy
   d. UV-Vis Spectroscopy
4. Conjugated Pi Systems
   a. Molecular Orbital Theory
   b. Reactions Types
   c. Pericyclic Reactions
5. Aromatic Compounds and Reactions
   a. Nomenclature and Structure
   b. Reactions of Aromatic Systems
   c. Multiple Substituents
   d. Elimination-Addition
6. Aldehydes and Ketones
   a. Introduction and Nomenclature
   b. Preparation
   c. Reactions
7. Carboxylic Acids and their Derivatives
   a. Nomenclature
   b. Structure and Properties
   c. Preparation
   d. Reactions and Derivatives
8. Enols and Enolates
   a. Alpha Carbon Chemistry
   b. Reactions
   c. Synthetic Strategies
9. Amines
   a. Nomenclature
   b. Properties
   c. Preparation
   d. Synthetic Strategies
   e. Reactions

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Resources

Mayo, Dana W. and Ronald M. Pike and David. C Forbes. *Microscale Organic Laboratory: With Multistep and Multiscale Syntheses.* 5th ed. New York: Wiley Sons, 2010.

McMurry, John E. *Organic Chemistry.* 8th ed. Cengage Learning, 2011.

Pavia, Donald L. and Gary M. Lampman and George S. Kriz and Randall G. Engel. *A Small Scale Approach to Organic Laboratory Techniques.* 3rd ed. Cengage Learning, 2010.

Vollhardt, Peter and Neil E. Schore. *Organic Chemistry.* 7th ed. W.H. Freeman Company, 2014.

Carey, Francis and Robert Giuliano. *Organic Chemistry.* 9th ed. New York: McGraw-Hill, 2013.

Bruice, Paula Yurankis. *Organic Chemistry.* 6th ed. Upper Saddle River, NJ: Prentice Hall, 2010.

Wade, L. G. Jr. *Organic Chemistry.* 5th ed. Prentice Hall, 2003.

Klein, David R. *Organic Chemistry.* 2nd ed. New York: Wiley Sons, 2013.

Resources Other

1. Chemistry molecular model kit, such as CHEM-TUDOR; Z22, 249-6. Aldrich Chemical Company.
2. Eubanks, I. Dwaine. *Preparing for Your ACS Examination in Organic Chemistry: The Official Guide.* Milwaukee: American Chemical Society, Division of Chemical Education Examinations Institute, 2002.

Top of page

Key: 1119