SECTION HEADING

CHEM 2201: Organic Chemistry I

Description

Organic Chemistry I covers the structure, classification, and fundamental reactions of carbon compounds. Specific topics include molecular structure, nomenclature, isomerism, reaction mechanisms, and reaction classes including proton transfer, nucleophilic substitution, elimination, and alkene addition. This course is for students majoring in science, pre-engineering, or pre-health (medicine, pharmacy, veterinary medicine). This course is the first semester in a two-semester organic chemistry sequence. This course includes a lab.

Credits

5

Prerequisite

CHEM 1101

Corequisite

None

Topics to be Covered

1. Structure and bonding

2. Acids and bases

3. Organic molecules and functional groups

4. Conformational and constitutional isomers

5. Alkanes

6. Stereochemistry

7. Mass spectrometry, infrared spectroscopy, and nuclear magnetic resonance spectroscopy

8. Organic reactions

9. Alkyl halides and nucleophilic substitution

10. Alkyl halides and elimination reactions

11. Alcohols, ethers, and related compounds

12. Alkenes

13. Alkynes

14. Oxidation and reduction

Learning Outcomes

1. Predict properties and reactivity of organic molecules using concepts of molecular structure, formal charge, and resonance

2. Translate between compound names and representations of structure

3. Analyze the relative energies of molecular structures

4. Create and employ 3-dimensional structures to determine the constitutional and stereochemical isomeric relationships between molecules

5. Identify various functional groups within complex molecules, correlate physical properties with functional group structure, and predict relevant reactions each functional group will undergo

6. Predict the products of acid-base, substitution, elimination, and addition reactions through the application of thermodynamic and kinetic principles

7. Create logical synthetic strategies by combining reactions into practical multi-step sequences

8. Propose reaction mechanisms using the curved-arrow formalism

9. Employ data from IR and NMR spectroscopy to identify organic compounds, and develop an understanding of how each of these analytical techniques work

10. Plan organic chemical reactions using proper reaction stoichiometry calculations

11. Perform successful organic chemical reactions with hands-on use of reaction glassware and equipment, practicing proper laboratory technique to maximize product yield and purity

12. Separate and purify chemical compounds

13. Determine the identity of organic samples through physical and spectroscopic methods

14. Determine the qualitative and quantitative purity of organic samples through physical and spectroscopic methods

15. Model the scientific method by performing inquiry- or research-based laboratory experiments or projects in which the student makes decisions regarding experimental design and execution

16. Demonstrate responsible laboratory safety and waste handling practices including the use of proper fume hoods or fume extraction for chemicals that emit hazardous vapors

17. Communicate the procedure, results, and relative success of an experiment with respect to the experimental objectives in the form of a laboratory notebook, written reports, or verbal presentation

Credit Details

Lecture: 3

Lab: 2

OJT: 0

MnTC Goal Area(s): Goal Area 03 - Natural Sciences

Minnesota Transfer Curriculum Goal Area(s) and Competencies

Goal Area 03: Natural Sciences

1. Demonstrate understanding of scientific theories.

2. Formulate and test hypotheses by performing laboratory, simulation, or field experiments in at least two of the natural science disciplines. One of these experimental components should develop, in greater depth, students' laboratory experience in the collection of data, its statistical and graphical analysis, and an appreciation of its sources of error and uncertainty.

3. Communicate their experimental findings, analyses, and interpretations both orally and in writing.

4. Evaluate societal issues from a natural science perspective, ask questions about the evidence presented, and make informed judgments about science-related topics and policies.

Transfer Pathway Competencies

Chemistry Transfer Pathway AS

Organic Chemistry I

Required Course Competencies

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3. Analyze the relative energies of molecular structures

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8. Propose reaction mechanisms using the curved-arrow formalism

9. Employ data from IR and NMR spectroscopy to identify organic compounds, and develop an understanding of how each of these analytical techniques work

Organic Chemistry 1 & 2 Lab Competencies

1. Plan organic chemical reactions using proper reaction stoichiometry calculations

2. Perform successful organic chemical reactions with hands-on use of reaction glassware and equipment, practicing proper laboratory technique to maximize product yield and purity

3. Separate and purify chemical compounds

4. Determine the identity of organic samples through physical and spectroscopic methods

5. Determine the qualitative and quantitative purity of organic samples through physical and spectroscopic methods

6. Model the scientific method by performing inquiry- or research-based laboratory experiments or projects in which the student makes decisions regarding experimental design and execution

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8. Communicate the procedure, results, and relative success of an experiment with respect to the experimental objectives in the form of a laboratory notebook, written reports, or verbal presentation