

8. STUDENT LEARNING OUTCOMES

Upon completion of the course, the student will demonstrate the ability to:

- Use valence bond and orbital hybridization theories to rationalize the three-dimensional structure of organic molecules.
- Identify structural features of alkanes, cycloalkanes, alkenes, alkynes, alkyl halides, alcohols, ethers, aromatic compounds, aldehydes, ketones, acids and acid derivatives.
- Write the names and structural formulas for alkanes, alkenes, alkynes, alkyl halides, alcohols, ethers and aromatic compounds.
- Document the relevant reactions in the multi-step synthesis of an organic compound.
- Predict and rationalize potential reaction pathways for major and minor products in organic reactions using kinetics and thermodynamics.
- Predict the regiochemistry and stereochemistry of the following organic reaction mechanisms using curved arrow notation:
 - Free radical substitution
 - Electrophilic and free-radical addition
 - Nucleophilic aliphatic substitution
 - Elimination
 - Electrophilic aromatic substitution
 - Catalytic hydrogenation
- Differentiate enantiomers, diastereomers, and meso compounds.
- Propose reaction schemes that result in the generation of chiral center.
- Predict the major and minor products of substitution reactions at allylic positions, and electrophilic substitution in aromatic compounds through the use of conjugation and resonance theories.
- Identify and define aromatic compounds, and rationalize their stability.
- Use NMR, IR, MS, and UV-Vis spectroscopy to determine the structure of organic compounds

In the laboratory, the student will:

- Calculate the theoretical yield and percent yield for organic reactions.
- Prepare compounds discussed in lecture through single and multi-step synthesis using appropriate techniques listed above for their synthesis, purification, characterization and analysis.
- Perform the following standard laboratory techniques:
 - Melting point determination
 - Boiling point determination
 - Distillation
 - Filtration
 - Extraction
 - Reflux
 - Recrystallization
 - Sublimation
 - Chromatography
 - Infrared spectroscopy

9. TOPICAL COURSE OUTLINE

- Valence bond and molecular orbital descriptions of organic compounds
- Nomenclature, properties, and structures for alkanes, alkenes, alkynes, alkyl halides, alcohols, ethers and aromatic compounds
- Stereochemistry
- Reactions of alkanes
- Reactions of alkenes
- Reactions of alkynes
- Reactions of alkyl halides
- Delocalized electron resonance and aromatic compounds
- Reactions of benzene and substituted phenyl compounds
- Identification and analysis of organic compounds through the use of IR, NMR, MS, and UV-Vis spectroscopy

10. TEXTS AND MATERIALS USED: List of books and/or materials suggested for this course.

Smith, Organic Chemistry McGraw-Hill, 2006

Lehman, Multiscale Operational Organic Chemistry Prentice Hall, 2002

11. AMOUNT OF WRITING REQUIRED:

Writing required in laboratory reports, on exams, and on homework assignments to describe chemical systems and reactions.

12. METHODS OF EVALUATION: (Direct and indirect)

Written and practical tests and laboratory reports will be used to assess knowledge and skills.

13. AUTHORIZED SIGNATURE AND FILE DATE:

DEPARTMENT AND CAMPUS

**Physical Science Department
Harold Washington College**

5/06