



## 8. STUDENT LEARNING OUTCOMES

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

- Write the names and structural formulas for the following functional groups: alcohols, thiols, amines, aldehydes, ketones, acids and acid derivatives, heterocycles, carbohydrates.
- Predict the regiochemistry and stereochemistry of the following organic reaction mechanisms using curved arrow notation:
  - Additions to ketones, aldehydes, and acid derivatives
  - Oxidations and reductions
  - Nucleophilic aromatic substitution
  - Rearrangements (including Hoffman)
  - Enol condensations (including Aldol, Claisen, Dieckmann)
  - Diels-Alder reactions and other cycloadditions
- Use chemical principles to explain the physical and biological properties of lipids, carbohydrates, amino acids, proteins, nucleotides, DNA and RNA.
- Explain the catalytic activity of selected enzymes using structural and mechanistic principles.
- Document the relevant reactions in the multi-step synthesis of biologically relevant organic compounds.
- Predict and rationalize potential reaction pathways for major and minor products in organic reactions using kinetics, thermodynamics, and neighboring group effects.
- Use NMR, IR, MS, and UV-Vis spectroscopy to determine the structure of organic compounds containing the functional groups listed above.

In the laboratory, the student will:

- Demonstrate increased proficiency using standard laboratory techniques.
- Perform chemical reactions involving the functional groups listed above.
- Prepare biologically relevant organic compounds using multi-step synthesis.
- Analyze and identify simple biological molecules through chemical and spectroscopic techniques.

## 9. TOPICAL COURSE OUTLINE

- Review of structures, properties, and reactions from Organic I
- Reactions of alcohols and phenols
- Reactions of ethers, epoxides, thiols
- Reactions of aldehydes and ketones
- Reactions of amines
- Reactions of carboxylic acids
- Reactions of carboxylic acid derivatives
- Enol condensation reactions
- Biological molecules (lipids, proteins, carbohydrates, nucleic acids)
- Synthetic and biological polymers

**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**

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**Physical Science Department  
Harold Washington College**

5/06