

COURSE OUTLINE**Chemistry 106
Organic Chemistry****I. Catalog Statement**

Chemistry 106 is a study of the preparation, properties, and reactions of aliphatic and aromatic acids, amines, aldehydes, ketones, carbohydrates, heterocyclic compounds, amino acids, and proteins. Analysis as well as synthesis of compounds is stressed.

Units - 5.0

Lecture Hours - 3

Laboratory Hours - 6

Prerequisite: Chemistry 105 with a grade of "C" or better or equivalent course with 6 weekly hours of laboratory discussion

II. Course Entry Expectations

Skills Expectations: Reading - 5; Writing - 5; Listening/Speaking - 5 Math - 5

Prior to enrolling in the course, the student should be able to:

1. familiarize themselves with the system of classification of compounds by structure which is the framework of organic chemistry;
2. delineate the principles of organic chemical reactions through techniques of lecture, laboratory problem solving and computer-simulated experiments;
3. acquaint themselves with the laboratory methods and specialized instruments typically used in organic chemistry;
4. keep accurate laboratory records;
5. prepare themselves for pre-professional examinations that include organic chemistry, i.e. MCAT, DAT, pharmacy and dental hygiene aptitude examinations;
6. read and evaluate scientific material of significance to them as citizens.

III. Course Exit Standards

Upon successful completion of the required course work, the student will be able to:

Upon successful completion of the required course work, the student will be able to:

1. have improved on all the items listed under "*Course Entry Expectations*" above;
2. generate reasonable linear and convergent synthesis pathways for target organic compounds of interest;
3. perform organic chemical reactions semi-independently in an organic chemistry laboratory

- setting, monitor the progress of reactions, and interpret the experimental results;
- be familiar with the general structural features, properties, and limited number of reactions of biologically important organic macro-molecules such as carbohydrates, amino acids, proteins, lipids, DNA, and RNA.

IV. Course Content

A. Carboxylic Acids	16 hours
1. Structure	
2. Nomenclature	
3. Preparation	
4. Reactions	
5. Analysis of acids	
B. Functional Derivatives of Acids	16 hours
1. Structure	
2. Nomenclature	
3. Acid chlorides	
4. Acid anhydrides	
5. Amides	
6. Esters, fats, and oils, saponification	
7. Analysis of acid derivatives	
C. Amines	16 hours
1. Structure	
2. Classification	
3. Nomenclature	
4. Physical properties	
5. Preparation	
6. Reactions	
7. Analysis of amines	
D. Diazonium Salts	16 hours
1. Structure	
2. Classification	
3. Reactions	
4. Syntheses using diazonium salts	
5. Coupling	
E. Phenols	16 hours
1. Structure	
2. Nomenclature	
3. Preparation	
4. Reactions	
5. analysis of phenols	
F. Aldehydes and Ketones	16 hours
1. Structure	
2. Nomenclature	
3. Physical properties	
4. Preparation	
5. Reactions	
6. Analysis of aldehydes and ketones	
G. Polyfunctional Compounds	16 hours
1. Glycols	
2. Dicarboxylic acids	

- 3. Keto acids
- H. Carbohydrates 16 hours
 - 1. Monosaccharides
 - a. definition and classification
 - b. structure
 - c. stereoisomerism
 - d. nomenclature
 - 2. Reactions of monosaccharides
 - a. Identification of isomers
 - 3. Disaccharides
 - 4. Polysaccharides
- I. Lipids 8 hours
 - 1. Waxes
 - 2. Triglycerides
 - 3. Phospholipids
 - 4. Steroids, Prostaglandins, and Terpenes
- J. Amino Acids and Proteins 8 hours
 - 1. Structure and preparation of amino acids
 - 2. Reactions
 - 3. Proteins
 - a. Classification
 - b. Structure

V. **Methods of Presentation**

The following instructional methodologies may be used in the course:

1. Traditional white board and lecture format.
2. Computer-simulated experiments

VI. **Assignments and Methods of Evaluation**

1. Five one-hour examinations
2. Data and observations are recorded in a laboratory notebook the majority of which should be written in essay format. These reports are turned in and graded during the semester.
3. Computer-simulated experiments
4. A Research paper on a molecule of the student's choosing with embedded 2-D and 3-D computer generated molecular graphics
5. Final Examination of 2.5 hours.

VII. **Textbook**

Pavia, Introduction to Organic Lab Techniques, 2nd edition
Thompson, Brooks/Cole, 2004
13th Grade Textbook Reading Level. ISBN 0-534-40833-8

Wade, L.G. Organic Chemistry, 7th edition.
Prentice Hall, 2009
13th Grade Textbook Reading Level.
ISBN 0-3-2159231-X

Wade, Organic Chemistry Solution Manual
ISBN: 0-321-59871-7

VIII. Student Learning Outcomes

1. Expand, reinforce, and apply all of the concepts and skills acquired in the first semester of organic chemistry to organic compounds containing additional functional groups including arenes, amines, aldehydes, ketones, carboxylic acids and the derivatives of carboxylic acids.
2. Outline multi-step syntheses of more complex organic compounds using reactions learned to date via serial and convergent strategies.
3. Understand the basic physical, chemical, and stereochemical properties of organic compounds of biological importance.
4. Apply and reinforce the laboratory techniques learned in Chemistry 105 to the synthesis and characterization of a variety of organic compounds.
5. Using a combination of classical and modern spectroscopic tools, to systematically identify an unknown organic compound.
6. Safely handle laboratory glassware, equipment, chemicals, and generated waste using guidelines and basic knowledge about the hazards associated with operations in an organic chemistry laboratory.
7. Maintain a complete and organized record of laboratory experimental data and observations in accordance with the format of the scientific notebook.