

NOVA COLLEGE-WIDE COURSE CONTENT SUMMARY
CHM 241 - ORGANIC CHEMISTRY I (3 CR.)

Course Description

Introduces fundamental chemistry of carbon compounds, including structures, physical properties, syntheses, and typical reactions. Emphasizes reaction mechanisms. Part I of II. Lecture 3 hours per week.

General Course Purpose

This is a transfer course in organic chemistry for science majors that will satisfy various pre-health degree requirements. This course is designed for students pursuing bachelor's degrees in biology, chemistry or chemical engineering and as a prerequisite for students seeking professional degrees in medical, pharmaceutical, dental, and veterinary programs and for certain advanced nursing programs.

Course Prerequisites/Corequisites

Prerequisites: CHM 112 with a grade of C or higher, or equivalent and a satisfactory placement score for ENG 111.

Course Objectives

Upon completion of the course students will be able to:

- Apply bonding concepts, molecular architecture, and isomerism to the general aspects of organic structures
- Use acid-base theory, electronic effects, and steric effects to correlate chemical reactivity and molecular structure
- Identify oxidation, reduction, addition, substitution, elimination, rearrangement and cyclization reactions in the various organic reaction processes and mechanisms
- Generate and analyze reactions for specific classes of organic compounds
- (such as alkanes, alkenes, alkynes, alkyl halides and alcohols) and distinguish between them
- Complete challenging sequence syntheses of the specific classes of compounds such as alkanes, alkenes, alkynes, alkyl halides and alcohols
- Generate IUPAC nomenclature and common names of the classes of compounds such as alkanes, alkenes, alkynes, alkyl halides and alcohols including stereochemical assignments
- Identify compounds based on $^1\text{H-NMR}$, $^{13}\text{C-NMR}$, IR and mass spectroscopy data

Major Topics to be covered

1. The atomic and hybrid orbitals of the carbon, oxygen, and nitrogen atoms and the molecular shapes arising from hybridization.
2. Lewis structures, resonance structures, line structure, formal charge, polarity and dipole moments of organic molecules.
3. Nomenclature, structures and conformations, physical properties, methods of preparation and reactions of:
 - a. Alkanes and cycloalkanes.
 - b. Alkyl halide compounds (emphasis on the $\text{S}_{\text{N}}2$, $\text{S}_{\text{N}}1$, $\text{E}2$, and $\text{E}1$ reactions with comparison of substitution vs. elimination).
 - c. Alcohols (including oxidation, reduction, substitution reactions, dehydration and ether formation).
 - d. Alkenes and alkynes (including cis-trans and E,Z structures, electrophilic addition to the C=C bond by symmetrical molecules [H_2 , X_2], and unsymmetrical molecules [HX , H_2O , BH_3], epoxidation reactions, hydroxylation reactions; oxidative cleavage reactions.)
 - e. Ethers and epoxides.
4. Acid-base theory (Arrhenius, Bronsted-Lowry, Lewis), thermodynamics and kinetics as related to organic reactions.
5. Stereochemical nomenclature, terminology, Fischer projections, stereochemical reactions, and resolution of enantiomers.

6. Introduction to spectroscopy, including IR, ^1H -NMR, ^{13}C -NMR, and mass spectra to deduce the structure of the organic compounds.