J. Sargeant Reynolds Community College
Course Content Summary

Course Prefix and Number: CHM 242 Credits: 3

Course Title: Organic Chemistry II

Course Description:

Introduces fundamental chemistry of carbon compounds, including structures, physical properties, syntheses and typical reactions. Emphasizes reaction mechanisms. Prerequisite(s): CHM 241 with grade of C or higher. Lecture 3 hours. Total 3 hours per week. 3 credits

General Course Purpose:

The general purpose of this course is to prepare the student for advanced study in organic chemistry through development of: skills in synthetic organic problem solving and in critical thinking, an understanding of the methods of organic chemistry, understanding of the general concepts and principles of organic chemistry.

Course Prerequisites/Corequisites:

CHM 241 with a grade of C or higher

Course Objectives:
Upon completing the course, the student will be able to:

Benzene, Alcohols and Phenols, Aldehydes and Ketones

- Describe and apply the rules of IUPAC nomenclature for alcohols, aldehydes, ketones, carboxylic acids, derivatives of carboxylic acids, arenes, and amines, including stereochemical assignments.
- Explain trends in physical properties for organic functional groups, such as intermolecular forces, acidity, solubility in water and organic solvents, melting points and boiling points.
- Interpret spectrum from instrumentation such as IR, NMR, UV-Vis and MS to determine the structure of appropriate families.

Carbonyl Condensation Reactions, Carbonyl Alpha Substitution Reactions

- Explain molecular stability and with concepts of resonance, conjugation, and by showing stepwise reaction mechanisms with Lewis structures and curved arrows that demonstrate electron flow.
- Draw the reaction mechanisms of carbonyl group compounds, including condensation reactions, keto-enol tautomerism, and nucleophilic addition reactions with carbon, nitrogen, oxygen or hydrogen nucleophiles.

Carboxylic Acid Derivatives and Nucleophilic Acyl Substitution Reactions, Ketones and Aldehydes

- Illustrate the use of carbon nucleophile reagents, such as organometallic Grignard reagent, phosphonium ylide Wittig reagent and carbon electrophile reagents like carbenes and organometallic-complexed carbenoids.
- Predict product structures and demonstrate mechanisms of oxidation and reduction reactions of alcohols, aldehydes, ketones, and carboxylic acids using reagents such as chromic acid, organic hydrides, catalytic reduction, and reactions such as Clemmensen and Wolf-Kishner reduction.
- Describe the synthetic pathways to prepare carboxylic acids and their derivatives and the stepwise mechanisms of typical reactions for these compounds.
- Describe alpha carbon chemistry of enolate formation and reactivity, including the formations of beta-hydroxy carbonyl compounds and beta-unsaturated compounds.

Conjugated Dienes, Benzene and Aromaticity, Chemistry of Benzene: Electrophilic Aromatic Substitution, Amines

- Describe mechanisms for stabilization of conjugated compounds such as pericyclic reactions and Diels-Alder reaction and for products associated with the electrophilic addition of conjugated dienes, such as Michael addition.
- Predict the stability of aromatic compounds by using molecular orbital theory and the Huckel 4n+2 rule; explain reaction mechanisms for aromatic compounds including aromatic substitution reactions directed by activating and deactivating effects of substituents.
- Describe the chemistry of amines, including synthesis and common reactions.

Major Topics to be Included:

- Benzene
- Alcohols and Phenols
- Aldehydes and Ketones
- Carbonyl Condensation Reactions
- Carbonyl Alpha Substitution Reactions
- Carboxylic Acid Derivatives and Nucleophilic Acyl Substitution Reactions
- Ketones and Aldehydes
- Conjugated Dienes
- Benzene and Aromaticity
- Chemistry of Benzene: Electrophilic Aromatic Substitution
- Amines

Effective Date/Updated: January 1, 2022