

Montgomery County Community College
CHE 261
Organic Chemistry I
4-3-3

COURSE DESCRIPTION:

LEARNING OUTCOMES	LEARNING ACTIVITIES	EVALUATION METHODS
4. Identify the conformations of small alkanes and cycloalkanes, with emphasis on cyclohexane chair conformation with mono, di and tri substitutions. Draw Newman projections and predict stability of molecules.	Lectures Class Discussions Problem Solving Molecular Models Activity	Section Exam and Comprehensive Final Exam
5. Identify and draw radical and polar reaction mechanisms and use energy diagrams to identify transition states, intermediates and reactant-product energy changes.	Lectures Class Discussions Problem Solving Emphasis on Reaction Mechanisms	Section Exam and Comprehensive Final Exam
6. Explain properties of alkenes and discuss electrophilic addition with the use of carbocation rearrangement.	Lectures Class Discussions Problem Solving Emphasis on Reaction Mechanisms Laboratory Activity and Report	Section Exam and Comprehensive Final Exam
7. Discuss synthesis and reactions of alkenes: elimination, addition, reduction, oxidation and radical polymerization. Write and explain mechanisms for common reactions of alkenes.	Lectures Class Discussions Problem Solving Emphasis on Reaction Mechanisms Laboratory Activity and Report	Section Exam and Comprehensive Final Exam
8. Name alkynes and discuss synthesis and reactions of alkynes: elimination, addition, hydration, reduction, oxidative cleavage and alkylation of acetylide anions.	Lectures Class Discussions Problem Solving Emphasis on Reaction Mechanisms Laboratory Activity and Report	Section Exam and Comprehensive Final Exam

LEARNING OUTCOMES	LEARNING ACTIVITIES	EVALUATION METHODS
9. Identify enantiomers, with one or more chirality centers, R, S configuration, diastereomers, meso compounds and racemic mixtures.	Lectures Class Discussions Problem Solving Molecular Models Activity	Section Exam and Comprehensive Final Exam
10. Name alkyl halides and discuss synthesis: radical halogenation and allylic bromination and discuss reactions: use of Grignard Reagents and coupling Reactions.	Lectures Class Discussions Problem Solving Laboratory Activity and Report Emphasis on Reaction Mechanisms	Section Exam and Comprehensive Final Exam
11. Discuss the mechanisms of alkyl halides: Sn1, SN2, E1, E1cb and E2; plus their kinetics and the	Lectures Class Discussions Problem Solving Emphasis on Reaction Mechanisms Laboratory Activity and Report	Section Exam and Comprehensive Final Exam
12. Interpret mass spectra using fragmentation patterns and infrared spectra using location of common functional groups.	Lectures Class Discussions Problem Solving Laboratory Activity and Report	Section Exam and Comprehensive Final Exam
13. Interpret ^{13}C , DEPT ^{13}C and ^1H NMR using chemical shifts, integration and spin-spin splitting techniques.	Lectures Class Discussions Problem Solving Laboratory Activity and Report	Section Exam and Comprehensive Final Exam
14. Discuss properties of conjugated dienes: addition reaction, electrophilic addition, kinetic vs. thermodynamic control, Diels-Alder reaction and ultraviolet spectroscopy.	Lectures Class Discussions Problem Solving Emphasis on Reaction Mechanisms	Section Exam and Comprehensive Final Exam

At the conclusion of each semester/session, assessment of the learning outcomes will be completed by course faculty using the listed evaluation method(s). Aggregated results will be submitted to the Associate Vice President of Academic Affairs. The benchmark for each learning outcome is that *70% of students will meet or exceed outcome criteria*.

SEQUENCE OF TOPICS:

- I. Structure and Bonding
 - A. Atomic Structure: Orbitals and Electron Configuration
 - B. Valence Bond Theory
 - C. Hybridization: sp , sp^2 and sp^3 Orbitals
 - D. Molecular Orbital Theory
- II. Polar Covalent Bonds; Acids and Bases
 - A. Electronegativity
 - B. Dipole Moments
 - C. Formal Charges
 - D. Rules and Drawing Resonance Structures
 - E. Bronsted-Lowry Definition
 - F. Using pK_a Values in Looking at Acid Strength
 - G. Organic Acids and Bases
 - H. Lewis Definition
 - I. Drawing Chemical Structures and Molecular Models
- III. Alkanes and Cycloalkanes
 - A. Functional Groups
 - B. Isomers
 - C. Alkyl Groups
 - D. Nomenclature
 - E. Properties
 - F. cis-trans Isomers of Cycloalkanes
- IV. Stereochemistry of Alkanes and Cycloalkanes
 - A. Conformations of Ethane, Propane and Butane
 - B. Baeyer Strain Theory
 - C. Conformations of Cyclopropane, Cyclobutane, Cyclopentane and Cyclohexane
 - D. Axial and Equatorial Bonds in Cyclohexane of Chair Conformation
 - E. Monosubstituted Cyclohexane
 - F. Conformational Analysis of di and tri Substituted Cyclohexane
 - G. Boat Cyclohexane
- V. Stereochemistry
 - A. Enantiomers
 - B. Chirality and Optical Activity
 - C. R, S Configuration
 - D. Diastereomers
 - E. Meso Compounds
 - F. Two Chirality Centers
 - G. Physical Properties of Stereoisomers
 - H. Racemic Mixtures and their Resolution

- XI. Reactions of Alkyl Halides
 - A. Walden Inversion
 - B. Nucleophilic Substitution and Kinetics
 - C. S_N2 Reaction and Kinetics
 - D. S_N1 Reaction Kinetics and Stereochemistry
 - E. Eliminations

6. Dehydration of Cyclohexanol
 - a. Preparation of Cyclohexene Microscale
 - b. Test for Alkanes and Alkenes. with Bromine Water
 - c. Infrared Spectroscopy
7. Macroscale Addition of Bromine to Stilbene to Prepare Meso-Stilbene Dibromide
8. Microscale Nucleophilic Substitution Reactions
9. Infrared Spectroscopy; Nuclear Magnetic Resonance; Ultraviolet Spectroscopy and Mass Spectroscopy

LEARNING MATERIALS:

McMurry, J. (2012). *Organic Chemistry* (8th ed.). Thomson and Brooks/Cole.

McMurry, S. (2012). *Study Guide and Student Solutions Manual* (7th ed.). Thomson and Brooks/Cole.

Williamson, K., Masters, K. (2011). *Macroscale and Microscale Organic Experiments* (6th ed.). Houghton-Mifflin Co.

Molecular Models

Other learning materials may be required and made available directly to the student and/or via the _____ and/or course management system.

COURSE APPROVAL:

Prepared by: Dr. E. Martins, Assistant Professor of Chemistry Date: 10/9/2004

Revised by: Dr. L. McAtee, Assistant Professor of Chemistry Date: 2/5/2009

VPAA/Provost Compliance Verification: Dr. John C. Flynn, Jr. Date: 9/11/2009

Revised by: Dr. L. McAtee, Assistant Professor of Chemistry Date: 12/17/2012

VPAA/Provost or designee Compliance Verification:

Victoria L. Bastecki-Perez, Ed.D. Date: 2/13/2013

Revised by: Debbie Dalrymple Date: 6/27/2016

VPAA/Provost or designee Compliance Verification:

Victoria L. Bastecki-Perez, Ed.D. Date: 6/27/2016