

Montgomery County Community College
CHE 132
Chemistry for Technology II
4-3-3

COURSE DESCRIPTION:

This course will present a brief overview of Nuclear Chemistry. The major portion of the semester will involve a survey of introductory Organic and Biochemistry. Topics will include the nomenclature, structure, physical properties, and chemical reactions of the major classes of Organic and Biological compounds. This course is subject to a course fee. Refer to <http://mc3.edu/adm-fin-aid/paying/tuition/course-fees> for current rates.

REQUISITES:*Previous Course Requirements*

- CHE 131 Chemistry for Technology I

Concurrent Course Requirements

None

LEARNING OUTCOMES Upon successful completion of this course, the student will be able to:	LEARNING ACTIVITIES	EVALUATION METHODS
1. Discuss natural and artificial nuclear changes.	Lecture Small Group Discussions Laboratory Experiments Daily Reading and Problem-Solving Assignments Section Examinations	Final Comprehensive Examination
2. Discuss structure, nomenclature, descriptive properties and chemical reactivity of the basic types of organic compounds.	Lecture Small Group Discussions Laboratory Experiments Daily Reading and Problem-Solving Assignments Section Examinations	Final Comprehensive Examination
3. Discuss structure, nomenclature, properties, and reactions of selected members of each biochemical class.	Lecture Small Group Discussions Laboratory Experiments Daily Reading and Problem-Solving Assignments Section Examinations	Final Comprehensive Examination

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:

- A) Lecture
1. Nuclear chemistry
 - a) Radioactivity and nuclear decay
 - b) Nuclear Equations
 - c) Decay, transmutation, fission, and fusion
 - d) Biological effects of radiation
 2. Organic Chemistry-Introduction
 - a) Bonding review
 - b) Shape and conformation of saturated hydrocarbons
 - c) Structure and nomenclature of alkanes
 - d) Isomers and nomenclature of alkanes
 - e) Reactions of alkanes
 - f) Sources and uses of alkanes-physical properties
 - g) Cycloalkanes -Structure, nomenclature, and properties
 3. Unsaturated Hydrocarbons
 - a) Bonding and orbital hybridization
 - b) Structure and nomenclature of alkenes
 - c) Geometric isomers of alkenes
 - d) Reactions of alkenes
 - e) Alkynes-structure, nomenclature and reactions
 - f) Cycloalkenes-structure, nomenclature and reactions
 - g) Aromatic Hydrocarbons-structure, nomenclature and reactions
 - h) Sources and uses of cyclic and aromatic hydrocarbons-physical properties
 4. Polymerization
 - a) Macromolecules and synthetic polymers
 - b) Reactions-Additions polymerization
 - c) Examples and uses of addition polymers
 5. Oxygen containing organic compounds
 - a) Introduction to functional groups
 - b) Alcohols-primary, secondary, tertiary
 - c) Nomenclature of alcohols
 - d) Reactions of alcohols
 - e) Phenols-structure, nomenclature, and reactions
 - f) Ethers-structure, nomenclature, and reactions
 - g) Thiols and thioethers-Comparison to alcohols and ethers
 - h) Physical properties of alcohols, ethers, phenols, and their sulfur analogs
 - i) Sources and uses of alcohols, ethers, phenols, and sulfur analogs

6. Aldehydes and ketones
 - a) Structure and nomenclature of aldehydes and ketones
 - b) Physical properties of aldehydes and ketones
 - c) Chemical reactions of aldehydes and ketones
 - d) Sources and uses of aldehydes and ketones
7. Carboxylic acids and their derivatives
 - a) Structure and nomenclature of carboxylic acids
 - b) Preparation of carboxylic acids
 - c) Reactions of carboxylic acids
 - d) Esters-structure and nomenclature
 - e) Reactions of esters
 - f) Polymerization-Condensation polymers
 - g) Phosphate esters and anhydrides-structure and uses
 - h) Acid halides-structure and uses
 - i) Sources and uses of carboxylic acids, esters, and their derivatives
8. Nitrogen containing organic compounds
 - a) Amides-structure and nomenclature
 - b) Reactions of amides
 - c) Polymerization-Condensation polymers of amides
 - d) Amines-structure and nomenclature
 - e) Reactions of amines
 - f) Sources and uses of amides and amines
9. Stereoisomerism
 - a) Optical activity and molecular structure
 - b) Projection formulas
 - c) Enantiomers
 - d) Diastereomers
 - e) Meso structures
 - f) Racemic modifications
10. Carbohydrates
 - a) Classification of carbohydrates
 - b) Monosaccharides
 - 1) Pentoses
 - 2) Hexoses
 - 3) Glucose, galactose, fructose, ribose
 - c) Disaccharides
 - 1) Sucrose, lactose, and maltose
 - 2) Disaccharide derivatives
 - d) Polysaccharides
 - 1) Starch, glycogen, and cellulose
 - 2) Polysaccharide derivatives
 - e) Chemical reaction of carbohydrates
 - f) Physical properties and uses of carbohydrates
11. Lipids
 - a) Classification of lipids
 - b) Simple lipids-Structure

- 1) Fatty acids
- 2) Glycerol esters
- 3) Waxes
- c) Compound lipids-Structure
 - 1) Phospholipids
 - 2) Lecithins
 - 3) Cephalins
 - 4) Sphingolipids
 - 5) Glycolipids
- d) Steroids
- e) Vitamins-lipid versus water-soluble
- f) Physical properties and uses
- 12. Amino acids and proteins
- 13. Structure and nomenclature of common amino acids
 - a) Stereochemistry of amino acids
 - b) Acid-base properties of amino acids-Amphoterism
 - c) Polypeptides-the peptide link
 - d) Proteins-Structure
 - 1) Primary
 - 2) Secondary
 - 3) Tertiary
 - 4) Quaternary
 - e) Properties and uses of proteins
- 14. Nucleic Acids
 - a) Structure of DNA and RNA
 - b) Base sequence and the genetic code

B) Laboratory

A minimum of eight laboratory experiments are to be conducted during the semester. The list of experiments (or a reasonable substitute) is indicated below. Additional laboratory activities are strongly recommended. Laboratory experiments can also be obtained from Falcon Chemistry (the computer-based experiments available on the MCCC network) and the Vernier computer technology equipment available in SC 312.

- 1) Standardization of a base solution
- 2) Titration of Acetic acid
- 3) Melting points
- 4) Hydrocarbons
- 5) Alcohols-Ketones
- 6) Esters
- 7) Simple distillations
- 8) Synthesis of polymers

LEARNING MATERIALS:

Textbook:

Hein, Pattison, Arena, Best. (2012). *Introduction to General, Organic, and Biochemistry* (9th ed.). John Wiley & Sons, Inc.

Laboratory Manual:

Hein, Peisen, Ritchey. (2012). *Introduction to General, Organic, and Biochemistry in the Laboratory* (9th ed.). John Wiley & Sons, Inc.

Learning Resource Center-Library-College Hall

Student Success Center-College Hall

Chemistry Computer Laboratory-SC 312

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

COURSE APPROVAL:

Prepared by: Raymond J. Leary, Professor of Chemistry Date: 10/23/2004

Revised by: Raymond J. Leary, Professor of Chemistry Date: 2/5/2009

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

Revised by: Raymond J. Leary, Professor of Chemistry Date: 12/22/2012

VPAA/Provost or designee Compliance Verification:

Victoria L. Bastecki-Perez, Ed.D. Date: 1/27/2013

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

VPAA/Provost or designee Compliance Verification:

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

This course is consistent with Montgomery County Community College's mission. It was developed, approved and will be delivered in full compliance with the policies and procedures established by the College.