

Montgomery County Community College  
CHE 122  
General Chemistry-Organic  
4-3-3

**COURSE DESCRIPTION:**

This course emphasizes introductory Organic Chemistry and Biochemistry. The examination of the structure and reactivity of the major Organic and Biological classes of compounds will include an exploration of industrial and consumer oriented applications. This course is most appropriate for students with a background of basic Inorganic Chemistry and an interest in expanding their view of fundamental Chemistry or establishing a firm foundation for further study involving Biology or Allied Health coursework. This course is acceptable preparation for admission into Dental Hygiene and Nursing programs, and is also a continuation of CHE 121. 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*

- High school Chemistry or CHE 121 - General Chemistry I

*Concurrent Course Requirements*

- MAT 090 - Fundamentals of Algebra, or MAT 011 - Beginning Algebra, or MAT 011B - Beginning Algebra with Review of Arithmetic with a minimum grade of C within 5 years. May be taken prior or during course.

LEARNING OUTCOMES Upon successful completion of this course, the student will be able to:	LEARNING ACTIVITIES	EVALUATION METHODS
1. Apply the qualitative and quantitative principles learned in the first portion of the course (General Chemistry I) to the solution of problems dealing with the areas of Organic Chemistry, and Biochemistry.	Lecture Small Group Discussions Laboratory Experiments Computer-Based Laboratory Experiments Daily Reading and Problem-Solving Assignments Section Examinations	Laboratory Experiments Final Comprehensive Examination

LEARNING OUTCOMES	LEARNING ACTIVITIES	EVALUATION METHODS
2. Discuss the structure, nomenclature, properties, uses, and reactions of selected types of organic compounds.	Lecture Small Group Discussions Laboratory Experiments Computer-Based Laboratory Experiments Daily Reading and Problem-Solving Assignments Section Examinations	Laboratory Experiments Final Comprehensive Examination
3. Discuss the structure, nomenclature, properties, uses, and reactions of selected types of biochemical compounds.	Lecture Small Group Discussions Laboratory Experiments Computer-Based Laboratory Experiments Daily Reading and Problem-Solving Assignments Section Examinations	Laboratory Experiments Final Comprehensive Examination
4. Perform simple separation and characterization tests on common types of Organic substances.	Lecture Small Group Discussions Laboratory Experiments Computer-Based Laboratory Experiments Daily Reading and Problem-Solving Assignments Section Examinations	Laboratory Experiments Final Comprehensive Examination
5. Perform simple organic synthesis experiments.	Lecture Small Group Discussions Laboratory Experiments Computer-Based Laboratory Experiments Daily Reading and Problem-Solving Assignments Section Examinations	Laboratory Experiments 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. Review of basic Chemical Kinetics and Equilibrium concepts
  - a) Rates of Reactions
  - b) Chemical Equilibrium
  - c) Equilibrium expressions and equilibrium constants
  - d) Le Chatelier's Principle
2. Introduction to Organic Chemistry-Alkanes
  - a) Review of chemical bonding
  - b) Structure of alkanes and alkane isomers
  - c) Nomenclature of alkanes
  - d) Conformation and shape of alkane molecules
  - e) Physical properties of alkanes
  - f) Reactions of alkanes
  - g) Cycloalkanes
3. Hydrocarbons- Alkenes, alkynes, and aromatic compounds
  - a) Structure of alkenes, alkynes, and cycloalkenes
  - b) Nomenclature of alkenes, alkynes, and cycloalkenes
  - c) Cis-trans isomerism
  - d) Physical properties of alkenes, alkynes, and cycloalkenes
  - e) Reactions of alkenes, alkynes, and cycloalkenes
  - f) Addition polymerization
  - g) The chemistry of the aromatic hydrocarbons
  - h) Uses of aliphatic and aromatic hydrocarbons
4. Introduction to oxygen containing functional groups
  - a) Structure of alcohol, phenols, and ethers
  - b) Nomenclature of alcohols, phenols, and ethers
  - c) Physical properties of alcohols, phenols, and ethers
  - d) Reaction of alcohols, phenols, and ethers
  - e) Introduction to thiols, sulfides, and halogen-containing organic compounds
  - f) Uses of alcohols, phenols, ethers, sulfur analogs, and alkyl halides
5. Aldehydes and ketones
  - a) Structure of aldehydes and ketones
  - b) Nomenclature of aldehydes and ketones
  - c) Physical properties of aldehydes and ketones
  - d) Reactions of aldehydes and ketones
  - e) Uses of aldehydes and ketones
6. Carboxylic acids and their derivatives
  - a) Structure and nomenclature of carboxylic acids
  - b) Structure and nomenclature of carboxylate salts
  - c) Structure and nomenclature of esters
  - d) Structure and nomenclature of amides
  - e) Structure and nomenclature of acid halides
  - f) Structure of phosphate esters and anhydrides
  - g) Physical properties of carboxylic acids and their derivatives

- h) Reactions of carboxylic acids and their derivatives
- i) Condensation polymerization
- j) Uses of carboxylic acids and their derivatives
- 7. Amines
  - a) Structure and nomenclature of aliphatic and aromatic amines
  - b) Physical properties of amines
  - c) Reactions of amines
  - d) Uses of amines
- 8. Biochemistry-Carbohydrates
  - a) Introduction to carbohydrates
  - b) Stereochemistry-optical isomers
  - c) Structure of monosaccharides
  - d) Structure of disaccharides
  - e) Structure of polysaccharides
  - f) Physical and chemical properties of carbohydrates
  - g) Uses and biological applications of carbohydrates
- 9. Biochemistry-Lipids
  - a) Structure and classification of lipids
    - 1) Simple lipids
    - 2) Complex lipids
    - 3) Steroids
    - 4) Other classes of lipids
  - b) Introduction to physical properties and chemical reactions of lipids
  - c) Uses and biological applications of lipids
- 10. Amino acids and proteins
  - a) Structure and nomenclature of amino acids
  - b) Stereochemistry and acid-base properties of amino acids
  - c) Peptides and polypeptides
  - d) Proteins
  - e) Structure of proteins
    - 1) Primary
    - 2) Secondary
    - 3) Tertiary
    - 4) Quaternary
  - f) Physical and chemical attributes of amino acids and proteins
  - g) Uses and biological application of proteins
- 11. Nucleic Acids
  - a) Structure of RNA and DNA
  - b) 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 room SC 312.

- 1) Chemical Equilibrium
- 2) Distillation
- 3) Boiling points/melting points
- 4) Hydrocarbons
- 5) Alcohols, etc.
- 6) Esterification
- 7) Polymers
- 8) Synthesis of an organic compound

#### LEARNING MATERIALS:

##### Textbook:

McMurry, Ballantine, Hoeger, and Peterson. (2013). *Fundamentals of General, Organic, and Biological Chemistry, Volume 2*. Fourth Custom Edition for Montgomery County Community College. Pearson.

##### Laboratory Manual:

Hein. (2009). *General Organic and Biochemistry Lab*. Custom Edition for Montgomery County Community College. Wiley.

Chemistry Computer Laboratory-SC 312

Learning Resource Center-College Library-College Hall

Student Success Center-College Hall

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
--	-----------------

Revised by: James Bretz	Date: 6/7/2023
-------------------------	----------------

VPAA or designee Compliance Verification:	Date: 6/7/2023
---	----------------



*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.*