Montgomery County Community College
CHE 121
General Chemistry - Inorganic
4-3-3

COURSE DESCRIPTION:
The course is designed to acquaint liberal arts majors with certain fundamental facts, principles, and techniques of chemistry with a view toward their application in modern life. Emphasis is placed on the scientific approach. This course is acceptable preparation for admission into Dental Hygiene, Nursing and MLT programs. 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

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. Discuss basic chemical theories and laws that explain the behavior of inorganic substances and mixtures.	Lecture Small Group Discussions Laboratory Experiments (Including Computer-Based Laboratory Experiments) Daily Reading and Problem-Solving Assignments	Section Examinations Final Comprehensive Examination Laboratory Experiments (Including Computer-Based Laboratory Experiments)
2. Explain basic descriptive chemistry of simple inorganic substances and mixtures.	Lecture Small Group Discussions Laboratory Experiments (Including Computer-Based Laboratory Experiments) Daily Reading and Problem-Solving Assignments	Section Examinations Final Comprehensive Examination Laboratory Experiments (Including Computer-Based Laboratory Experiments)

LEARNING OUTCOMES	LEARNING ACTIVITIES	EVALUATION METHODS
3. Solve quantitative problems covering the properties and reactions of simple inorganic substances and mixtures.	Lecture Small Group Discussions Laboratory Experiments (Including Computer-Based Laboratory Experiments) Daily Reading and Problem-Solving Assignments	Section Examinations Final Comprehensive Examination Laboratory Experiments (Including Computer-Based Laboratory Experiments)
4. Perform laboratory experiments on the qualitative and quantitative properties of simple inorganic substances and mixtures.	Laboratory Experiments (Including Computer-Based Laboratory Experiments)	Laboratory Experiments (Including Computer-Based Laboratory Experiments)
5. Gather, process, and interpret experimental data from the performance of simple inorganic laboratory experiments.	Lecture Small Group Discussions Laboratory Experiments (Including Computer-Based Laboratory Experiments)* Daily Reading and Problem-Solving Assignments	Section Examinations Final Comprehensive Examination Laboratory Experiments (Including Computer-Based Laboratory Experiments)
6. Discuss the contribution of chemistry to everyday life.	Lecture Small Group Discussions Laboratory Experiments (Including Computer-Based Laboratory Experiments) Daily Reading and Problem-Solving Assignments	Section Examinations Final Comprehensive Examination Laboratory Experiments (Including Computer-Based Laboratory Experiments)

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. Introduction to Chemistry and the scientific method
    a) General classifications of matter
    b) Properties of matter
    c) Changes of matter
    d) Elements and compounds
    e) Solutions and suspensions
    f) Examples of elements, compounds, and mixtures in science and society
2. Chemical calculations and measurement systems
    a) SI and metric measurement systems
    b) Scientific notation and significant figures
    c) Factor-label method conversions
    d) Temperature, density, specific gravity, and specific heat calculations
3. Introduction to atomic structure
    a) Historical overview of the atomic model
    b) Subatomic particles
    c) Atomic number, mass number, atomic mass, and isotopes
    d) Modern atomic theory
    e) The periodic table and the atomic model
    f) Electronic structure of atoms
4. Bonding-Ionic compounds
    a) Electronic structure and the formation of ions
    b) Common ions
    c) Transition metal ions and polyatomic ions
    d) Nomenclature and formulas for ionic compounds
    e) Properties of ionic compounds
    f) Occurrence of ions in consumer products and nature
    g) Introduction to acids and bases
5. Bonding-Covalent compounds
    a) Lewis dot representation
    b) Drawing simple Lewis structures
    c) Introduction to simple organic compounds and isomers
    d) Coordinate bonding
    e) Resonance
    f) Polyatomic species
    g) Bond polarity, molecular geometry, and molecular polarity
    h) Nomenclature and formulas for covalent compounds
    i) Properties of covalent compounds
6. Chemical Reactions and stoichiometry
    a) Writing and balancing chemical equations
    b) Classes of chemical reactions
    c) The mole concept
    d) Stoichiometry

7. Kinetics, Equilibrium, and Thermodynamics
    a) Introduction to thermodynamic functions
        1) Enthalpy
        2) Entropy
        3) Gibb's Free Energy
    b) Introduction to reaction rates
    c) Introduction to equilibrium states
    c)
8. States of matter
    a) General properties of the states of matter and changes of state
    b) Intermolecular forces of attraction
    c) Gas Laws
    d) Ideal and real gases
    e) Types of solids
    f) Unique properties of water
9. Introduction to solution chemistry
    a) Solutions and suspensions
    b) Solubility and concentration
    c) Molarity calculations
    d) Colligative properties of solutions
10. Acid-base chemistry
    a) Introduction to electrolytes and non-electrolytes
    b) Acid-base models
    c) Common acids and bases
    d) Acid-base reactions
    e) Introduction to pH
    f) Titrations
    g) Buffers
11. Nuclear Chemistry
    a) Types of radioactivity and nuclear decay
    b) Writing and balancing nuclear equations
    c) Radioactive half-life
    d) Nuclear transmutations
    e) Nuclear fission and fusion
    f) Applications involving nuclear changes

B) Laboratory Activities

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 the Vernier computer technology equipment available in room SC 312.

1) Laboratory Techniques
2) Measurements
3) Preparation and Properties of Oxygen
4) Lewis Structures and Molecular Models
5) Identification of Selected Anions
6) Quantitative Preparation of Potassium Chloride
7) Double Displacement Reactions
8) Single Displacement Reactions
9) Chemical Equilibrium
10) Gas Laws
11) Water in Hydrates
12) Properties of Solutions
13) Neutralization
14) Composition of Potassium Chlorate

LEARNING MATERIALS:

Textbook:

McMurry, Ballantine, Hoeger and Peterson. (2013). *Fundamentals of General, Organic, and Biological Chemistry* (7th ed.). Prentice Hall (Pearson Education, Inc.).

Laboratory Manual:

Hein, Peisen and Ritchey. (2009). *Introduction to General, Organic, and Biochemistry in the Laboratory* (9th ed.). John Wiley & Sons, Inc.

Learning Resources Centers (Central-College Hall, West-South Hall)

The Brendlinger Library/AV Library (Central)
Library (West)
Tutoring Services (Central, West)

Computer-Based Laboratory (Central-Room 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: Dr. Janet A. Graden, Instructor of Chemistry Date: 2/13/2009
VPAA/Provost Compliance Verification: Dr. John C. Flynn, Jr. Date: 9/11/2009

Revised by: Dr. Janet Graden, Instructor of Chemistry Date: 6/10/2012
VPAA/Provost or designee Compliance Verification:
Victoria L. Bastecki-Perez, Ed.D. Date: 6/19/2012

Revised by: Dr. Janet Graden, Assistant Professor of Chemistry Date: 1/4/2013
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: Debbie Dalrymple Date: 1/11/2018
VPAA/Provost or designee Compliance Verification:
Victoria L. Bastecki-Perez, Ed.D. Date: 1/30/2018

Revised by: Jamez 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.