

CHM 151 General Chemistry I

COURSE DESCRIPTION:

Prerequisites: DRE-097 or ENG 002, Take DMA-010 DMA-020 DMA-030 DMA-040 DMA-050 or, MAT 003 Tier 2

Corequisites: None

Course description. This course covers fundamental principles and laws of chemistry. Topics include measurement, atomic and molecular structure, periodicity, chemical reactions, chemical bonding, stoichiometry, thermochemistry, gas laws, and solutions. Upon completion, students should be able to demonstrate an understanding of the fundamental chemical laws and concepts as needed in CHM 152. Laboratory experiments and computer-based exercises augment and reinforce the basic principles discussed in lecture as well as provide practical examples. *This course has been approved to satisfy the Comprehensive Articulation Agreement as a general education course in Natural Science.*

Course Hours per Week: Class, 3, Lab, 3. Semester Hours Credit, 4.

LEARNING OUTCOMES:

Upon completing requirements for this course, the student will be able to:

1. Perform mathematical calculations related to chemistry, including, molarity, thermochemistry, dimensional analysis, and stoichiometry.
2. Generate and correctly identify chemical formulas and chemical structures with correct nomenclature.
3. Recognize and categorize major chemical reactions such as, combustion, precipitation, acid-base, and oxidation-reduction.
4. Describe and predict the behavior of ideal gases in various conditions.
5. Determine the electron configurations of atoms and ions.
6. Use chemical bond theories to predict molecular bonding, shape, and polarity.

OUTLINE OF INSTRUCTION:

- I. Basic Concepts
 - A. Scientific method
 - B. Measurement and use of the metric system
 - C. Precision and accuracy: uncertainty and significant digits
 - D. Dimensional analysis
- II. Atoms, ions, and molecules
 - A. States of matter
 - B. Elements, compounds, mixtures, ions and molecules
 - C. Atomic theory (basic atomic structure)
 - D. Periodic table
 - E. Nomenclature of inorganic compounds
- III. Stoichiometry
 - A. Atomic and molecular masses

- B. The mole
 - C. Empirical and molecular formulae
 - D. Reactant and product calculations; yields
- IV. Chemical reactions
- A. Types of reactions
 - B. Balancing
 - C. Types of solutes (ionic and molecular); electrolytes
 - D. Solubility rules
 - E. Molecular and ionic equations
 - F. Solutions
- V. Gases
- A. Characteristics and properties of gases
 - B. Gas laws and ideal vs. real gases
 - C. Kinetic-molecular theory
 - D. Dalton's laws of partial pressures
 - E. Diffusion, effusion and Graham's Law
- VI. Thermochemistry and energy
- A. Conversion of and conservation of matter and energy
 - B. Energy and chemical changes/reactions
 - C. Enthalpy and heats of reaction
 - D. Hess's Law
 - E. Measurement, calorimetry
- VII. Electronic structure
- A. Electromagnetic spectrum and radiant energy
 - B. Bohr model of the atom
 - C. Quantum model of the atom
 - D. Orbitals, electron spin and electronic configuration
 - E. Periodicity: size, electron affinity and ionization energy (including main group element properties)
- VIII. Chemical bonding and molecular geometry
- A. Lewis structures, octet rules
 - B. Ionic and covalent bonding
 - C. VSEPR, valence bond, and molecular orbital theory
 - D. Resonance forms
 - E. Electronegativity, polarity and dipole moments

REQUIRED TEXTBOOK AND MATERIAL:

The textbook and other instructional material will be determined by the instructor.