

CHM 151 GENERAL CHEMISTRY I

COURSE DESCRIPTION:

Prerequisites: RED 090 or DRE 098 and MAT 080 or DMA 010, 020, 030, 040, 050, 060, 070, 080, or satisfactory score on placement test

Corequisite: none

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 for the general education core requirement in natural sciences/mathematics.* Course Hours Per Week: Class, 3. Lab, 3. Semester Hours Credit, 4.

LEARNING OUTCOMES:

Upon completion of this course, the student will be able to:

1. Perform measurements/mathematical calculations related to chemistry
2. Understand chemical nomenclature and atomic symbols
3. Describe the properties, types and states of matter
4. Explain chemical structure and molecular orbitals
5. Explain quantum theory and electronic structure
6. Use the periodic table and chemical handbooks
7. Define and use stoichiometry and the mole concept
8. Explain the basics of thermochemistry
9. Explain chemical bonding
10. Explain gases and their properties
11. Understand the bulk properties of liquids
12. Understand and work with colligative properties
13. Understand solutions

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. Conversion of and conservation of matter and energy
 - B. Atomic and molecular masses
 - C. The mole
 - D. Empirical and molecular formulae
 - E. 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

- V. Thermochemistry and energy
 - A. Energy and chemical changes/reactions
 - B. Enthalpy and heats of reaction
 - C. Hess's Law
 - D. Measurement, calorimetry

- VI. Electronic structure
 - A. Electromagnetic spectrum and radiant energy
 - B. Quantum mechanics
 - C. Bohr model of the atom
 - D. Orbitals, electron spin and electronic configuration
 - E. Periodicity: size, electron affinity and ionization energy (including main group element properties)

- VII. Chemical bonding and molecular geometry
 - A. Lewis structures, octet rules
 - B. Ionic, covalent and metallic bonding
 - C. VSEPR, valence bond, and molecular orbital theory
 - D. Resonance forms
 - E. Electronegativity, polarity and dipole moments

- VIII. 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

- IX. Liquids, solids, and solutions
 - A. Kinetic-molecular description of liquids and solids
 - B. Intermolecular forces and their effects on liquid properties
 - C. Bulk properties of liquids and solids
 - D. Vapor pressures and phase changes
 - E. Phase diagrams
 - F. The solutions process and factors affecting solubility
 - G. Colligative properties of solutes
 - H. Colloids

REQUIRED TEXT AND MATERIALS:

To be selected by Instructor/Discipline Chair.