

CHM 151 GENERAL CHEMISTRY I

COURSE DESCRIPTION:

Prerequisites: RED 090 and MAT 080, or satisfactory score on placement test, and CHM 094 or CHM 131 or high school chemistry within the last 5 years.

Corequisites: MAT 171

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:

- a. Perform measurements/mathematical calculations related to chemistry
- b. Understand chemical nomenclature and atomic symbols
- c. Describe the properties, types and states of matter
- d. Explain chemical structure and molecular orbitals
- e. Explain quantum theory and electronic structure
- f. Use the periodic table and chemical handbooks
- g. Define and use stoichiometry and the mole concept
- h. Explain the basics of thermochemistry
- i. Explain chemical bonding
- j. Explain gases and their properties
- k. Understand the bulk properties of liquids
- l. Understand and work with colligative properties
- m. 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

CHM 151

- 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

CHM 151

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:

Chang, R. Chemistry. 10th ed. New York: McGraw-Hill Higher Education, 2010.

Chemical Education Resources. General Chemistry I. CHM 151. Special edition for Durham Technical Community College. Pacific Grove: Thomson Learning, publishing as Brooks/Cole, 2006.

OPTIONAL:

Chang, R. Student Study Guide for use with Chemistry. 9th ed. New York: McGraw-Hill Higher Education, 2010.

Chang, R. Student Solutions Manual for use with Chemistry. 9th ed. New York: McGraw-Hill Higher Education, 2010

SUGGESTED REFERENCES, PERIODICALS, AND VISUAL AIDS:

Numerous supplementary texts, programmed materials, and audiovisual packages are available in the Educational Resources Center. These materials may be utilized to reinforce the lecture and lab material or to provide material for independent study by the student.

STATEMENT OF STUDENTS WITH DISABILITIES:

Students who require academic accommodations due to any physical, psychological, or learning disability are encouraged to request assistance from a disability services counselor within the first two weeks of class. Likewise, students who potentially require emergency medical attention due to any chronic health condition are encouraged to disclose this information to a disability services counselor within the first two weeks of class. Counselors can be contacted by calling 536-7207, ext 1418 or by visiting the Student Development Office in the Phail Wynn Jr. Student Services Center, room 1309.