

## CHM 152 GENERAL CHEMISTRY II

### COURSE DESCRIPTION:

Prerequisites: CHM 151

Corequisites: None

This course continues the study of the fundamental principles and laws of chemistry. Topics include kinetics, equilibrium, ionic and redox equations, acid-base theory, electrochemistry, thermodynamics, introduction to nuclear and organic chemistry, and complex ions. Upon completion, students should be able to demonstrate an understanding of chemical concepts as needed to pursue further study in chemistry and related professional fields. 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. Define chemical kinetics and chemical equilibrium
- b. Explain acids, bases, pH and their equilibria
- c. Understand Bronsted-Lowry and Lewis acid base theory
- d. Explain common ion, buffer solutions, and solubility products
- e. Define spontaneity and identify such processes
- f. Explain the three laws of thermodynamics
- g. Determine potentials and worked performed by galvanic cells
- h. Describe electrolysis and corrosion via electrochemical terms
- i. Explain radioactive decay and transmutation, and differentiate fission and fusion
- j. Explain transition metals, coordination compounds, isomerism, and explain color changes in chemical terms.
- k. Differentiate between the various classes of organic compounds
- l. Explain amino acids, proteins, fats, carbohydrates, and DNA
- m. Perform acid base titrations and explain the data
- n. Identify metallic elements qualitatively
- o. Improve computer skills learned in CHM 151

### OUTLINE OF INSTRUCTION

- I. Chemical kinetics
  - A. Reaction rates and mechanisms
  - B. Catalysis

## CHM 152

- II. Chemical equilibrium
  - A. Homogeneous and heterogeneous equilibria
  - B. Le Chatelier's principle
  - C. Relationship between chemical equilibria and chemical kinetics
  
- III. Acids and bases
  - A. Acidic and basic solutions; pH
  - B. Bronsted-Lowry and Lewis theory of acids and bases
  - C. Strong acids and bases; weak acids and bases
  - D. Titrations and quantitative analysis
  
- IV. Aqueous equilibria
  - A. Buffer solutions and common-ion effect
  - B. Solubility equilibria and the solubility constant
  - C. Qualitative analysis for metallic elements
  
- V. Chemical thermodynamics
  - A. Spontaneity and thermodynamics; enthalpy
  - B. Entropy and the Second Law of thermodynamics
  - C. Gibbs free energy
  - D. Free energy relationships to equilibrium constant and work
  
- VI. Electrochemistry
  - A. Galvanic and voltaic cells
  - B. EMF, cell potential, and batteries
  - C. The Nernst equation
  - D. Electrolysis and corrosion
  
- VII. Nuclear chemistry
  - A. Spontaneous radioactivity and transmutation
  - B. Fission and fusion
  - C. Biological effects
  
- VIII. Transition elements and coordination chemistry
  - A. Transition metal oxidation states
  - B. Magnetism in transition metals
  - C. Electrical/heat conduction in metals
  - D. Structure of complexes
  - E. Chelates, nomenclature and isomerism
  - F. Color
  
- IX. Organic and biochemistry
  - A. Hydrocarbons and their various derivatives
  - B. Petroleum
  - C. Polymers
  - D. Proteins, amino acids

## CHM 152

- E. Carbohydrates, fats
- F. Nucleic acids and DNA

### REQUIRED TEXT AND MATERIALS:

Chang, R. Chemistry. 10<sup>th</sup> 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. 9<sup>th</sup> ed. New York: McGraw-Hill Higher Education, 2010.

Chang, R. Student Solutions Manual for use with Chemistry. 9<sup>th</sup> 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.