

Course discipline/number/title: CHEM 1117: General, Organic and Biological Chemistry I

A. CATALOG DESCRIPTION

1. Credits: 4
2. Hours/Week: 3 lecture, 2 lab
3. Prerequisites (Course discipline/number): CHEM 1101
4. Other requirements: Instructor Permission
5. MnTC Goals (if any): Goal 3/Natural Sciences

B. COURSE DESCRIPTION: This course is the first of two courses that provide a broad introduction to the principles of general, organic, and biological chemistry. This course includes a discussion of general chemistry principles related to measurements, matter and energy, atomic theory, bonding, and reactivity. An introduction to organic chemistry functional groups and isomerization is included. Chemistry knowledge is vital for general education students to make informed decisions on political, social, ethical, health, and environmental issues.

C. DATE LAST REVISED (Month, year): February, 2021

D. OUTLINE OF MAJOR CONTENT AREAS:

1. Review of Measurement
  - a) Units and standards of measurement
  - b) Scientific notation
  - c) Accuracy, error, uncertainty and precision
  - d) The factor label method in calculations
  - e) Density
2. Matter and Energy
  - a) Properties of matter
  - b) Atoms, elements, mixtures, chemical symbols
  - c) Writing proper chemical equations
  - d) Kinetic and potential energy
3. Types of Reactions
  - a) Identify types of reactions
  - b) Evaluate redox reactions
4. Quantitative Composition of Compounds and Reactions
  - a) The mole concept
  - b) Atomic formula and molecular masses
  - c) Stoichiometry
5. Atomic Theory and the Periodic Nature of Elements
  - a) The periodic law and the periodic table
  - b) Atomic structure
  - c) Electron configuration
6. Chemical Compounds and Chemical Bonds
  - a) Ionic and covalent bonding
  - b) Lewis Structures
  - c) Geometric shapes of molecules and molecular polarity
7. States of Matter
  - a) Kinetic molecular theory and intermolecular forces
  - b) A molecular view of the three common states of matter
  - c) Pressure, volume, and temperature relationships
  - d) The Ideal Gas Law
  - e) Dalton's Law of Partial Pressure
  - f) Vapor pressure, viscosity, surface tension, and boiling point
8. Solutions
  - a) Types of solutions
  - b) Mass %, volume %, m/vol %, M, N
  - c) Solution stoichiometry
  - d) Dilution

- D. OUTLINE OF MAJOR CONTENT AREAS: Continued. . .
- e) Colligative properties including osmosis/osmolarity
9. Chemical Equilibria and Rates
- a) Equilibrium expressions
  - b) Le Chatelier's principle
  - c) Factors that affect the rate of chemical reactions
10. Acids and Bases
- a) Properties of aqueous acids and bases
  - b) Acid/base strength
  - c) The pH concept
  - d) Buffer solutions
11. Introduction to Organic Chemistry
- a) Identifying the functional groups and their corresponding nomenclature
  - b) Isomerism
- E. LEARNING OUTCOMES (GENERAL): The student will be able to:
- 1. Demonstrate basic chemistry concepts and laws.
  - 2. Predict chemical or physical changes using chemical concepts or laws.
  - 3. Solve chemical problems involving conversion units, stoichiometry, solution concentrations, gas laws, acid-base titrations, and pH-type problems.
  - 4. Connect chemistry to everyday life activities, especially those related to the health-related aspects of one's life.
- F. LEARNING OUTCOMES (MNTC):
- Goal 3/Natural Sciences: The student will be able to:
- 1. Demonstrate understanding of scientific theories.
  - 2. Formulate and test hypotheses by performing laboratory, simulation, or field experiments in at least two of the natural science disciplines. One of these experimental components should develop, in greater depth, student's laboratory experience in the collection of data, it's statistical and graphical analysis, and an appreciation of its sources of error and uncertainty.
  - 3. Communicate their experimental findings, analyses, and interpretations both orally and in writing.
- G. METHODS FOR EVALUATION OF STUDENT LEARNING: Methods may include but are not limited to:
- 1. Laboratory reports and/or quizzes
  - 2. Problem-solving exercises
  - 3. Tests involving chemical reactions and laws and problem-solving techniques
- H. RCTC CORE OUTCOME(S). This course contributes to the meeting the following RCTC Core Outcome(s): **Critical Thinking**. Students will think systematically and explore information thoroughly before accepting or formulating a position or conclusion.
- I. SPECIAL INFORMATION (if any):
- The initial lab session explains and familiarizes the student with general safety hazards and safety equipment in the lab. During the pre-lab discussion, the hazardous characteristics of the chemicals used during the lab are discussed. The students will be instructed on the proper disposal of any hazardous products. The instructor will direct all students to wear necessary protective equipment while working with the chemicals.