

Course discipline/number/title: CHEM 1127: Chemical Principles I

A. CATALOG DESCRIPTION

1. Credits: 4
2. Hours/Week: 3 lecture, 3 lab
3. Prerequisites (Course discipline/number): MATH 0099
4. Other requirements: College Reading Level
5. MnTC Goals (if any): Goal 3/Natural Science

B. COURSE DESCRIPTION: This first semester General Chemistry course is an of an in-depth study of terminology and chemical principles pertaining to the areas of measurements, atomic theory, nomenclature, reactions, chemical calculations, solids/liquids/gases, thermochemistry, quantum theory, periodicity, bonding, and molecular geometry. *Note: It is highly recommended that students have completed a previous chemistry course (high school or college) prior to registering for this course. This course will build upon the topics in the previous chemistry course.*

C. DATE LAST REVISED (Month, year): May, 2023

D. OUTLINE OF MAJOR CONTENT AREAS:

1. Measurements
  - a) Scientific method
  - b) Significant figures
  - c) Scientific notation
  - d) Measurement systems
  - e) Dimensional analysis
2. Atomic Structure of Matter
  - a) Classification of matter
  - b) Subatomic particles
  - c) Chemical formulas and nomenclature
  - d) Quantum theory
  - e) Electron configurations
  - f) Orbital diagrams
  - g) Periodic trends
3. Chemical Calculations
  - a) Percent composition
  - b) Stoichiometry
  - c) Molarity
4. Chemical Reactions
  - a) Balancing equations
  - b) Net ionic equations
  - c) Redox reactions
  - d) Precipitation reactions
  - e) Acid-Base reactions
5. Thermochemistry
  - a) Calorimetry
  - b) Hess's Law
  - c) Standard heats of reaction
6. Bonding
  - a) Ionic bonding
  - b) Covalent bonding
  - c) Metallic bonding

- C. OUTLINE OF MAJOR CONTENT AREAS: Continued. . .
- d) Valence bond theory
  - e) Molecular orbital theory
7. Molecular Shape and Structure
- a) Lewis structures
  - b) Valence shell electron pair repulsion theory
  - c) Molecular polarity
8. Solids, Liquids, Gases
- a) Kinetic molecular theory
  - b) Gas laws
  - c) Intermolecular forces
- E. LEARNING OUTCOMES (GENERAL): The student will be able to:
1. Use proper chemical vocabulary in written laboratory reports.
  2. Solve problems using experimental and/or simulated data and relate them to the chemical principles and laws involved.
  3. Describe chemical interactions on the molecular scale.
  4. Acquire basic skills in laboratory operations including making measurements, preparing solutions, operating instrumentation, designing experiments, and reporting and interpreting both quantitative and qualitative data.
  5. Recognize chemical applications in everyday life.
- F. LEARNING OUTCOMES (MNTC):
- Goal 3/Natural Science: 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, students' laboratory experience in the collection of data, its 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
  2. Quizzes
  3. Problem solving exams
  4. American Chemical Society standardized exam
- G. RCTC CORE OUTCOME(S). This course contributes to meeting the following RCTC Core Outcome(s):
- Communication. Students will communicate appropriately for their respective audiences.
- Critical Thinking. Students will think systematically and explore information thoroughly before accepting or formulating a position or conclusion.
- H. 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.