

University of Arkansas - Fort Smith

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General Syllabus

CHEM 10003 Chemical Principles

Credit Hours: 3

Lecture Hours: 3

Laboratory or other types of Hours: 0

Prerequisite(s) or Corequisite(s): MATH 11003 or higher-level math or exemption by placement score.

Effective Catalog: 2025 - 2026

I. Course Information

A. Catalog Description

Covers the fundamental principles of chemistry as well as the mathematical manipulations required to solve chemistry problems. (ACTS: CHEM 1004; must have CHEM 10003/CHEM 10001)

B. Additional Information - None

II. Student Learning Outcomes

A. Subject Matter

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

1. Use the concepts of precision and accuracy in measurement with the metric system.
2. Describe the structure of atoms and explain how the structure determines the reactivity of elements.
3. Describe the structure of molecules and explain how the structure determines the reactivity of molecules.
4. Describe and explain the bonding of atoms to each other.
5. Define the physical states of matter in terms of structure and describe the influence energy has on these states.
6. Solve mathematical relationships involving the pressure, volume, temperature, and molar quantity of gases.
7. Identify and write formulae for covalent and ionic compounds.

8. Write chemical equations to illustrate the basic classes of chemical reactions.
9. Work problems relating to concentration of solutions.
10. Explain the effects that different kinds of particles have on the solution process and the properties of solutions.
11. Distinguish between acids and bases in terms of physical and chemical properties.
12. Demonstrate a greater appreciation for the chemical orchestration that is physical life.

B. University Learning Outcomes

Chemical Principles enhances student abilities in the following areas:

Analytical Skills

Critical Thinking Skills: Students will identify a problem or issue and will research, evaluate, and compare information from varying sources in order to evaluate authority, accuracy, recency, and bias relevant to the problems/issues. The student will generate solutions/analysis of problems/issues evaluated and will assess and justify the solutions and/or analysis.

III. Major Course Topics

- A. Chemistry and the Scientific Method
- B. Matter and Measurement; Unit Conversions; Mathematical Manipulations
- C. Matter and Energy
- D. Atoms; Energy Sublevels and Orbitals; Nuclear Power
- E. The Atomic Nucleus
- F. Chemical Bonds
- G. Naming Ionic and Covalent Compounds
- H. Chemical Reactions and Stoichiometry
- I. Gases
- J. Liquids and Solids
- K. Oxidation and Reduction Reactions
- L. Solutions
- M. Acids and Bases
- N. Introduction of Organic Compounds