Course Outline

2026-2027 Catalog

CHEM 1 - General Chemistry I

Catalog Description

Transfer Status: CSU/UC

Prerequisite: CHEM 11 or CHEM 51 or one year of high school Chemistry; and Intermediate Algebra or equivalent

Unit(s): 5.00

Lecture: 51.00 Contact hours/102.00 Out of class hours/153.00 Total hours/3.00 Unit(s)
Lab: 102.00 Contact hours/0.00 Out of class hours/102.00 Total hours/2.00 Unit(s)
Total: 153.00 Contact hours/102.00 Out of class hours/255.00 Total hours/5.00 Unit(s)

Course Description: This course introduces students to the basic principles of chemistry with a quantitative emphasis. Topics include atomic theory, chemical bonding, molecular geometry, chemical reactions, stoichiometry, gases, thermochemistry, intermolecular forces and solutions. This is the first semester of a one-year course in chemistry intended for majors in the natural sciences (chemistry, biochemistry, biology, physics, pre-medicine), mathematics, and engineering. The two-semester sequence of CHEM 1 and CHEM 2 provides the basic chemical background needed for further investigations into our physical environment. Graded only. (C-ID CHEM 110/CHEM 120S).

Objectives

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

1. Demonstrate an understanding of the fundamental principles of chemistry, including: Atomic and Molecular Structure, bonding, basic treatment of Quantum Theory, Periodic Properties, Stoichiometry, Gas Laws, States of Matter and an introduction to Solutions.
2. Demonstrate basic analytical skills by interpreting graphs and schematics and diagnosing realistic physical problems.
3. Demonstrate conceptual understanding by being able to describe qualitatively the underlying causes of basic physical and chemical phenomena.

Course Content

Topic Titles / Suggested Time Topic

Lecture

Topics	Lec Hrs
Chemical Foundations	3.00
Atoms, Molecules, Ions, and Nomenclature	4.00
Stoichiometry	5.00
Types of Chemical Reactions and Solution Stoichiometry	7.00
Gases	5.00
Thermochemistry	5.00
Atomic Structure, Periodicity, and Quantum Theory	7.00
General Concepts of Bonding	5.00
Covalent Bonding and Orbitals	5.00
Condensed States of Matter: Liquids and Solids	5.00
Total Hours:	**51.00**

Lab

Topics	Lab Hrs
Scientific Notation, Significant Figures, Propagation of Error, Unit Analysis	6.00
Scientific Measurements	6.00
Determination of Density Using a Pycnometer	3.00
Isotopes and Atomic Mass	3.00
Stoichiometry: Gravimetric Analysis and Titration	9.00
Aqueous Reactions: Solubility of Ionic Compounds and Oxidation-Reduction Reactions	6.00
Scientific Graphing Techniques	6.00
Measurement and Interpretation of Gas Variable Relationships	9.00
Thermochemistry and Calorimetry	6.00
Spectroscopic Measurement of Atomic Line Spectra and Analysis of Atomic Models	9.00
Spectrophotometric Analysis	6.00
Bonding Models and Molecular Structure	9.00
Paper Chromatography	3.00

Topics	Lab Hrs
Crystalline Structures	3.00
Phase Transitions and Vapor Pressure of Liquids	6.00
Nomenclature	3.00
Demonstration of Lab Skills	3.00
Qualitative Analysis of Periodic Properties	6.00
Total Hours:	**102.00**

Methods of Instruction

A. Class Activities
B. Collaborative Group Work
C. Homework: Students are required to complete two hours of outside-of-class homework for each hour of lecture
D. Instructor Demonstrations
E. Laboratory Experiments
F. Lecture
G. Reading Assignments

Methods of Evaluation

A. Exams/Tests
B. Quizzes
C. Homework
D. Class participation
E. Final Examination
F. Group Participation
G. Laboratory Experiment and Activity Reports

Examples of Assignments

Reading Assignments

1. Read the section on stoichiometry in the text. Be prepared to solve a related problem on a test.
2. Read the section on relationships among variables describing gases in the text. Be prepared to discuss the relationships in class.

Writing Assignments

1. For the experiment on stoichiometry, create a properly formatted report in your lab notebook. The report must include the title, date, a clear statement of purpose, an overview or procedure, complete data results tables, and a conclusion based on your observations.
2. Write a paragraph on the use of kinetic molecular theory to explain why the pressure of a gas increases as temperature increases while holding number of particles and volume constant.

Out-of-Class Assignments

1. After reviewing the section on stoichiometry in the text, complete the assigned homework problems at the end of the chapter.
2. After reading the experiment on pressure temperature relationships in gases, complete the corresponding prelab assignment by graphing the sample data and analyzing the graph to estimate the value of absolute zero.

Recommended Materials of Instruction

Steven S. Zumdahl, and Susan A. Zumdahl, Decoste, D. (2018). Chemistry. *Brooks Cole, a part of Cengage Learning, Belmont, CA, 10th.* 9781305957404.

Chemistry Faculty. (2022). Laboratory Manual for General Chemistry I (CHEM 1). *Butte College Department of Physical Sciences, Oroville, CA, Current.* Butte College.

Minimum Qualifications

Chemistry (Masters Required)

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