

BUTTE COLLEGE

COURSE OUTLINE

I. CATALOG DESCRIPTION

CHEM 1 - General Chemistry I

5 Unit(s)

Prerequisite(s): CHEM 110 or one year of high school chemistry; Math Level V

Recommended Prep: Reading Level IV; English Level IV

Transfer Status: CSU/UC

51 hours Lecture

102 hours Lab

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. (C-ID CHEM 110/120S). Graded only.

II. OBJECTIVES

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

- A. Demonstrate basic experimental knowledge by employing standard lab techniques for data gathering, judging the accuracy and reliability of data, creating informative graphs, and discussing the limitations of experimental designs.
- B. Demonstrate basic analytical skills by interpreting graphs and schematics and diagnosing realistic physical problems.
- C. Demonstrate conceptual understanding by being able to describe qualitatively the underlying causes of basic physical and chemical phenomena.

III. COURSE CONTENT

A. Unit Titles/Suggested Time Schedule

		Lecture
<u>Topics</u>		<u>Hours</u>
1. Chemical Foundations		2.00
2. Atoms, Molecules, Ions, and Nomenclature		4.00
3. Stoichiometry		4.00
4. Types of Chemical Reactions and Solution Stoichiometry		5.00
5. Gases		5.00
6. Thermochemistry		5.00
7. Atomic Structure, Periodicity, and Quantum Theory		6.00
8. General Concepts of Bonding		5.00
9. Covalent Bonding and Orbitals		5.00
10. Condensed States of Matter: Liquids and Solids		5.00
11. Properties of Solutions		5.00
Total Hours		51.00

Lab

<u>Topics</u>	<u>Hours</u>
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1. Scientific Notation, Significant Figures, Propagation of Error, Unit Analysis	6.00
2. Scientific Measurements	6.00
3. Determination of Density Using a Pycnometer	3.00
4. Isotopes and Atomic Mass	6.00
5. Stoichiometry: Gravimetric Analysis and Titration	6.00
6. Aqueous Reactions: Solubility of Ionic Compounds and Oxidation-Reduction Reactions	6.00
7. Scientific Graphing Techniques	6.00
8. Measurement and Interpretation of Gas Variable Relationships	9.00
9. Thermochemistry and Calorimetry	6.00
10. Spectroscopic Measurement of Atomic Line Spectra and Analysis of Atomic Models	9.00
11. Qualitative Analysis of Periodic Properties	6.00
12. Spectrophotometric Analysis	6.00
13. Bonding Models and Molecular Structure	9.00
14. Paper Chromatography	3.00
15. Crystalline Structures	3.00
16. Phase Transitions and Vapor Pressure of Liquids	6.00
17. Properties of Solutions	3.00
18. Demonstration of Lab Skills	3.00
Total Hours	102.00

IV. **METHODS OF INSTRUCTION**

- A. Lecture
- B. Demonstrations
- C. Laboratory Experiments
- D. Laboratory Exercises
- E. Students are required to complete two hours of outside-of-class homework for each course unit

V. **METHODS OF EVALUATION**

- A. Quizzes
- B. Written Examinations
- C. Laboratory Reports and Exercises

VI. **EXAMPLES OF ASSIGNMENTS**

- A. 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.
- B. 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.

C. 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.

VII. **RECOMMENDED MATERIALS OF INSTRUCTION**

Textbooks:

- A. Steven S. Zumdahl, and Susan A. Zumdahl. Chemistry. 9th Edition. Brooks Cole, a part of Cengage Learning, Belmont, CA, 2013.
- B. A. Wren, S. Sincoff, and E. Wannenmacher. Laboratory Manual for General Chemistry-CHEM 1. Current Edition. Butte College Department of Physical Sciences, Oroville, CA, 2015.

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Date: 04/20/2015