

BUTTE COLLEGE

COURSE OUTLINE

I. CATALOG DESCRIPTION

CHEM 51 - Elementary Inorganic Chemistry

5 Unit(s)

Prerequisite(s): CHEM 110 or one year 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 is a survey course in the principles of inorganic chemistry, including atomic theory and periodic properties, nuclear chemistry, electronic structure, chemical bonding, stoichiometry, gas behavior, solution chemistry, kinetics and equilibrium, acids and bases, oxidation and reduction, and elementary thermodynamics. It is recommended for allied health or applied science majors. (C-ID CHEM 101). Graded only.

II. OBJECTIVES

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

- A. demonstrate ability to perform calculations associated with chemistry using appropriate units and precision; this includes calculations required for properties of matter, heat transfer, chemical reactions (includes theoretical yield), equilibrium, gas/liquid/solid phase changes, solution concentrations/dilutions, etc.
- B. explain, analyze or predict physical and chemical properties of matter in terms of microscopic structure and vice versa; this includes qualitative and quantitative aspects of atomic structure, ionic and molecular compounds and bonding, chemical reactions, equilibrium, gas/liquid/solid/solution properties, acid/base behavior, etc.
- C. communicate using appropriate chemistry terms, symbols and conventions; this includes naming and writing chemical formulas for elements, compounds, and ions; chemical equations; units, etc.

III. COURSE CONTENT

A. Unit Titles/Suggested Time Schedule

Lecture	
<u>Topics</u>	<u>Hours</u>
1. Significant Figures/Dimensional Analysis	2.00
2. Matter and Energy	2.00
3. Atoms	5.00
4. Chemical Bonds	5.00
5. Moles/Stoichiometry	4.00
6. Chemical Reactions	4.00
7. Gases, Liquids, and Solids	4.00
8. Solutions, Colloids, Electrolytes	4.00
9. Enthalpy, Entropy, and Free Energy	4.00
10. Reaction Rates	4.00
11. Equilibrium	4.00
12. Acids and Bases	5.00
13. Nuclear Chemistry	4.00

Total Hours 51.00

Lab

<u>Topics</u>	<u>Hours</u>
1. Lab Safety	3.00
2. Lab Procedures and Policies	3.00
3. Measurements & Significant Figures	6.00
4. Physical Properties of Matter; density, chromatography	6.00
5. Atomic Structure; electron configurations, Periodic Table of the Elements	6.00
6. Nomenclature & Formulas; elements, ions, simple inorganic compounds, acids, hydrated salts	12.00
7. Chemical Reactions, Qualitative; classifying reactions, precipitation reactions	9.00
8. Chemical Reactions, Equations and Stoichiometry, including Thermochemistry; balancing chemical reactions, theoretical & percent yield, reactions with solids, aqueous reactions, reaction enthalpy	18.00
9. Chemical Kinetics; factors that affect chemical reaction rates	3.00
10. Chemical Equilibrium; LeChatelier's Principle	6.00
11. Gas Laws; Combined Gas Law, Ideal Gas Law, partial pressure & Dalton's Law, Gay-Lussac & absolute zero	9.00
12. Solutions; concentrations, dilutions, electrolytes	6.00
13. Acids, Bases & Buffers; titrations, pH	9.00
14. Nuclear Chemistry; nuclear particles, rates of decay	6.00
Total Hours	102.00

IV. METHODS OF INSTRUCTION

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

V. METHODS OF EVALUATION

- A. Exams/Tests
- B. Quizzes
- C. Homework
- D. Final Examination
- E. Laboratory Reports

VI. EXAMPLES OF ASSIGNMENTS

- A. Reading Assignments
 - 1. Read the appropriate sections in the textbook to prepare for a molecular geometry group activity in lab.

2. Read the introduction in the laboratory manual to prepare for an experiment associated with chemical vs. physical changes.

B. Writing Assignments

1. It has been observed that the water level in a perfectly sealed plastic bottle slowly decreases over a several year period, while water stored in a perfectly sealed glass bottle doesn't decrease. If the water loss is due to the diffusion of the water molecules through the walls of the container, why would it diffuse in a plastic bottle but not the glass bottle? (HINT: If everything is made of particles, how is density affected by particle position?) Write a paragraph explaining your answer; you may also include drawings.
2. Sort the following elements into separate groups with similar properties: Ar, Be, Br, Ca, Cl, Co, & Cr. Write a paragraph that explains what the elements in each group have in common and what differences there may be between elements in the same group.

C. Out-of-Class Assignments

1. Complete the end-of-chapter assigned problems/questions from the textbook regarding molecular compounds. Algorithmic and multiple-choice questions will be graded by an online system (Mastering Chemistry); essay answers will be graded by the instructor.
2. Complete the end-of-chapter assigned problems/questions from the textbook regarding atomic structure and the periodic table of the elements. Algorithmic and multiple-choice questions will be graded by an online system (Mastering Chemistry); essay answers will be graded by the instructor.

VII. RECOMMENDED MATERIALS OF INSTRUCTION

Textbooks:

- A. Tro, N. J.. Introductory Chemistry. 5th Edition. Prentice-Hall, Upper Saddle River NJ, 2014.
- B. Steven Sincoff, Martin Wallace & Lisa Nichols. Chem 51 Laboratory Manual. Current Edition. Butte College, 2014.

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