

CHM 104-4

PRINCIPLES OF CHEMISTRY I

Course Number

Course Name

SAULT COLLEGE OF APPLIED ARTS & TECHNOLOGY

SAULT STE. MARIE, ONTARIO

COURSE OUTLINE

Course Title: PRINCIPLES OF CHEMISTRY I

Code No.: CHM 104-4

Program: WATER RESOURCES AND PULP & PAPER ENGINEERING TECHNOLOGY

Semester: ONE

Date: JANUARY, 1989

Author: D. TROWBRIDGE/D. HEGGART

New: _____ Revision: X

APPROVED: 
Chairperson

Date: Jan 3/89



PRINCIPLES OF CHEMISTRY I

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PHILOSOPHY/GOALS:

An introductory course in Chemistry which deals with the structure of matter, electronic structure of atoms, periodic nature of the elements, bonding, nomenclature, equations, solubility and stoichiometry of solutions.

A comprehensive Workshop on report writing will be held during the second week of the semester.

METHOD OF ASSESSMENT (GRADING METHOD):

Theory	50	A = 80 - 100%
Lab	50	B = 70 - 79%
	<u>100</u>	C = 60 - 69%

The theory grade is the sum of all tests and assignments. Tests will include all work up to the time of each test. All students having 70% or more on term work are exempt from the final exam which will cover the whole course and counts 50% of the theory grade.

ATTENDANCE:

Your grade will be greatly affected by attendance at scheduled classes and labs. 85% is required at all theory classes while 100% is needed for all labs. Serious illness (doctor's care) is the only valid excuse.

TEXTBOOK(S):

Ebbing, Darrell D., General Chemistry, Houghton Mifflin Co., 1984.



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Chairperson

APPROVED:

CHM 104

PRINCIPLES OF CHEMISTRY I

Principles of Chemistry is taught to students in the Water Resources and Pulp & Paper Technology programs in both the first and second semesters.

CHM 104 is taught in the first semester of the program and is a pre-requisite for CHM 218 which is a continuation of Principles of Chemistry theory in Semester 2. CHM 218 can be taken upon successful completion of CHM 104 or with prior approval of the instructor.

CHM 104 consist of four hours per week, two hours being devoted to theory and two hours spent on laboratory work.

UNIT II: CALCULATIONS WITH CHEMICAL FORMULAS AND EQUATIONS

1.1	Atomic Weights
1.2	Formula Weights
1.3	The Mole Concept Definition of Mole Mole Calculations
1.4	Mass Percentages from the Formula
1.5	Elemental Analysis
1.6	Determining Molecular Formulas Empirical Formula from Elemental Composition Molecular Formula from Empirical Formula
1.7	Molecular Interpretation of a Chemical Equation

UNIT I: ATOMIC THEORY: PURE SUBSTANCES AND MIXTURES, NOMENCLATURE

- 1.1 Atoms, Molecules, and Ions
 - Atoms
 - Molecules and Molecular Substances
 - Ions and Ionic Substances
 - A Word on Naming Substances
 - Chemical Reactions
 - Nomenclature 7.10, 7.11
- 1.2 Oxidation Numbers
- 1.3 Naming Simple Compounds
 - Binary Compounds
 - Acids
 - Ionic Substances
- 1.4 Balancing Simple Chemical Equations
- 1.5 Classification of Matter
 - Chemical Constitution - Element, Compound, or Mixture?
 - Physical State - Solid, Liquid or Gas?

UNIT II: CALCULATIONS WITH CHEMICAL FORMULAS AND EQUATIONS

- 2.1 Atomic Weights
- 2.2 Formula Weights
- 2.3 The Mole Concept
 - Definition of Mole
 - Mole Calculations
- 2.4 Mass Percentages from the Formula
- 2.5 Elemental Analysis
- 2.6 Determining Molecular Formulas
 - Empirical Formula from Elemental Composition
 - Molecular Formula from Empirical Formula
- 2.7 Molecular Interpretation of a Chemical Equation

UNIT II - Continued

- 2.8 Stoichiometry of a Chemical Reaction
- 2.9 Limiting Reactant; Theoretical and Percentage Yields
- 2.10 Molar Concentration
- 2.11 Diluting Solutions
- 2.12 Stoichiometry of Solution Reactions

UNIT III: ATOMIC STRUCTURE: ELECTRON CONFIGURATIONS AND PERIODICITY

- 3.1 The Bohr Theory of the Hydrogen Atom
Atomic Line Spectra
Bohr's Postulates
- 3.2 Quantum Mechanics
- 3.3 Quantum Numbers and Atomic Orbitals
- 3.4 Electron Spin and the Pauli Exclusion Principle
Electron Configurations and Orbital Diagrams
- 3.5 Building-Up Principle (Aufbau Principle)
- 3.6 Hund's Rule; Paramagnetism
- 3.7 Periodic Classification of the Elements
Predictions from the Periodic Table
Arrangement of the Elements by Atomic Number
Relationship to Electron Configurations
- 3.8 Some Periodic Properties
Atomic Radius
Ionization Energy
Electron Affinity
- 3.9 A Brief Description of the Main-Group Elements
Group 1A - 8A
Valence-Shell Configurations

UNIT IV: IONIC AND COVALENT BONDING

- 4.1 Describing Ionic Bonds
Lewis Electron-Dot Symbols
Energy Involved in Ionic Bonding

UNIT IV - Continued

- 4.2 Some Common Ions
 - Monatomic Ions of the Main-Group Elements
 - Transition-Metal Ions
 - Polyatomic Ions
 - Formulas of Ionic Compounds
- 4.3 Ionic Radii
- 4.4 Describing Covalent Bonds
 - Lewis Formulas
 - Coordinate Covalent Bond
 - Octet Rule
 - Multiple Bonds
- 4.5 Polar Covalent Bond; Electronegativity
- 4.6 Writing Lewis Electron-Don Formulas
 - Skeleton Structure of a Molecule
 - Steps in Writing Lewis Formulas
- 4.7 Exceptions to the Octet Rule
- 4.8 Delocalized Bonding; Resonance

UNIT V: SOLUTIONS

- 1. Types of Solutions
 - gas, liquid, solid
- 2. Ways of Expressing Concentration
 - Ratios
 - Mass
 - Percentage of Solute
 - Conversion of Concentration Units
 - Equivalents and Normality

COURSE OUTLINE
CHM 104
PRINCIPLES OF CHEMISTRY I
LABORATORY

1. Weighing Operations, Densities of Liquids and Solids
2. Separation of the Components of a Mixture
3. Formula of Hydrate
4. Chemical Reactions
5. Chemical Formulas
6. A Sequence of Chemical Reactions

N.B. - Five experiments to be completed, averaging one every three weeks. The lab report will be due at the end of the fourth week for each experiment.

