

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 TECHNO

Semester: ONE

Date: MAY 1986

Author: J. KORREY

New: _____ Revision: X

APPROVED:


Chairperson

June 12/86
Date

PRINCIPLES OF CHEMISTRY I

CHM 104-4

Course Name

Course Number

PHILOSOPHY/GOALS:

An introductory course in Chemistry which deals with the structure matter, electronic structure of atoms, periodic nature of the elem 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	<u>50</u>	B = 70 - 79%
	100	C = 60 - 69%

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

ATTENDANCE:

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

TEXTBOOK(S):

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

CHM 104

PRINCIPLES OF CHEMISTRY 1

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

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 consists of four hours per week, two hours being devoted to the lecture and two hours spent on laboratory work.

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 1
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.