

SAULT COLLEGE OF APPLIED ARTS & TECHNOLOGY
SAULT STE. MARIE, ONTARIO

COURSE OUTLINE

COURSE TITLE: PRINCIPLES OF CHEMISTRY I

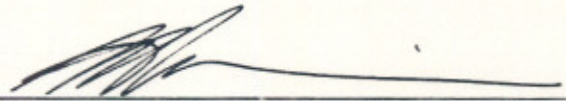
CODE NO.: CHM 104-4 SEMESTER: One

PROGRAM: ENVIRONMENTAL, WATER RESOURCES
AND PULP & PAPER ENGINEERING TECHNOLOGY

DATE: JULY 1991 PREVIOUS OUTLINE DATED: JULY 1990

AUTHOR: D. TROWBRIDGE/D. HEGGART

APPROVED:


DEAN

July 9/91
DATE

PRINCIPLES OF CHEMISTRY I

CHM 104-4

COURSE NAME

CODE NUMBER

TOTAL CREDIT HOURS: 64

PREREQUISITES: CHM099 or Grade 12 Chemistry

I. PHILOSOPHY/GOALS:

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

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

II. STUDENT PERFORMANCE OBJECTIVES:

Principles of Chemistry is taught to students in the Environmental Engineering, 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.

Students enrolling in CHM104 must have a high school credit in Chemistry or completed CHM099 or equivalent.

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

[Handwritten signatures and lines]

PRINCIPLES OF CHEMISTRY I

CHM 104-4

COURSE NAME

CODE NUMBER

III. TOPICS TO BE COVERED:

UNIT I: ATOMIC THEORY: PURE SUBSTANCES AND MIXTURES, NOMENCLATURE
CHAPTER 2

- 1.1 Atoms, Molecules, and Ions
Atoms
Molecules and Molecular Substances
Ions and Ionic Substances
A Word on Naming Substances
Chemical Reactions
Nomenclature
- 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
CHAPTERS 3 & 4

- 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

PRINCIPLES OF CHEMISTRY I

CHM 104-4

COURSE NAME

CODE NUMBER

UNIT II - Continued

- 2.8 Stoichiometry of a Chemical Reaction
- 2.9 Limiting Reactant; Theoretical and Percentage Yields

UNIT III: ATOMIC STRUCTURE: ELECTRON CONFIGURATIONS AND PERIODICITY
CHAPTERS 7 & 8

- 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 - CHAPTER 9

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

PRINCIPLES OF CHEMISTRY I

CHM 104-4

COURSE NAME

CODE NUMBER

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

IV. EVALUATION METHODS:

Theory	50	A+ = 90 - 100%
Lab	50	A = 80 - 89%
	100	B = 70 - 79%
		C = 60 - 69%
		R = Less than 60%

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 theory term work may be except from the final exam which will cover the whole course and counts 50% of the theory grade. The minimum required to pass CHM104 is 50% on theory and 70% on lab.

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.

PRINCIPLES OF CHEMISTRY I

CHM 104-4

COURSE NAME

CODE NUMBER

V. REQUIRED STUDENT RESOURCES:

Ebbing, Darrell D., General Chemistry, 3rd. edition, Houghton Mifflin Co., 1990.

Lab Manual for Chemistry 104, Sault College, 1990

VI. SPECIAL NOTES:

LABORATORY

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

13 wks

1 wk Lab Safety

1 wk Report Format

Total 15 wks

Students with special needs (e.g. physical limitations, visual impairments, hearing impairments, learning disabilities) are encouraged to discuss required accommodations confidentially with the instructor.

Your instructor reserves the right to modify the course as he/she deems necessary to meet the needs of students

Your grade will be greatly affected by attendance at scheduled classes and labs. 25% is required at all theory classes while 100% is needed for all labs. Serious illness (doctor's care) is the only valid excuse.