

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: MAY 1983
Author: J. S. KORREY

New: _____ Revision: X

APPROVED: _____
Chairperson Date

CALENDAR DESCRIPTION

PRINCIPLES OF CHEMISTRY I

Course Name

CHM 104-4

Course Number

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 and study skills will be held during the second week of the semester.

METHOD OF ASSESSMENT (GRADING METHOD):

Theory	50
Lab	50
	<u>100</u>

A	=	80 - 100%
B	=	70 - 79%
C	=	60 - 69%
I	=	Less than 60%

TEXTBOOK(S):

Malone, Leo J. "Basic Concepts of Chemistry"
John Wiley & Sons

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 semesters. The course consists of four hours per week, two hours being devoted to theory and two hours spent on related laboratory work.

CHM 104 is taught in the first semester of the program and is a prerequisite 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.

UNIT I - CHEMISTRY - MATTER, CHANGES, AND ENERGY (Review) - 2 hours

This unit gives a basic overview of the subject of chemistry. It introduces the student to matter, the changes in matter and the relation between matter and energy. Topics discussed are:

The Study of Chemistry
Chemistry and the Nature of Matter
Classification of Homogeneous Matter
Classification of Pure Substances
The Names and Symbols of the Elements
Properties of Matter
Physical and Chemical Changes
The Conservation of Mass
Energy Changes in Chemical Reactions
The Relationship of Matter and Energy

UNIT II - MATH AND MEASUREMENTS IN CHEMISTRY (Review)

This unit reviews the basic units of measure in the S. I. system and methods of conversion normally encountered in science courses. Topics discussed are:

Units of Measure - Length, Volume, Mass and Temperature. Density & Specific Gravity, Significant Figures, Conversion of Units, S. I. Units

UNIT III - THE STRUCTURE OF MATTER: THE NUCLEUS, AND NUCLEAR REACTIONS - 2 hours

In order to explain differences in properties of pure substances, this unit considers the particle structure of matter, ie: the "building blocks" of elements and compounds - atoms, molecules and ions. Topics discussed are:

Atomic theory is studied with emphasis on:
The work of Newton, Dalton, Thompson, Rutherford & Milliken
The Basic Structures of the Elements
Compounds and Formulas
Ions and Ionic Compounds
The Structure of the Atom
Atomic Number, Mass Number, and Atomic Weight

UNIT IV: THE PERIODIC NATURE OF THE ELEMENTS - 4 hours

In Unit III we discussed the building blocks of matter, atoms, molecules and ions. In this unit we shall look at the elements which are the simplest substances made up of atoms or molecules. Topics discussed are:

The Physical Properties of the Elements

Periods

Groups

Periodic Trends: Atomic Radius

Periodic Trends: Ionization Energy

Periodic Trends: Electron Affinity

UNIT V: ELECTRONIC STRUCTURE OF ATOMS - 4 hours

Electron Configurations

Oxidation State and Electronic Configuration

Hund's Rule

Aufban

Pauli Principle

UNIT VI: THE NATURE OF BONDING - 6 hours

Ionic Bonding

Covalent Bonding

Coordinate Covalent Bonding

Polyatomic Ions

Lewis Structures

Resonance Hybrids

Polarity & Electronegativity

UNIT VII: THE NAMING OF COMPOUNDS - 8 hours

As a continuation of building up of matter into compounds we shall learn how to represent these substances by chemical formulas and to name the compounds as well. Topics discussed are:

Oxidation States

Writing Formulas

Naming Metal-Nonmetal Binary Compounds

Naming Compounds with Polyatomic Ions

Naming Nonmetal-Nonmetal Binary Compounds

Naming Acids

UNIT VIII: QUANTITATIVE RELATIONSHIPS: THE MOLE - 4 hours

Now that we know how to write formulae and name compounds it seems appropriate to study the quantitative relations of substances in chemical terms: the MOLE. Topics discussed are:

The Mole
The Molar Mass of the Elements
The Molar Mass of Compounds
Percent Composition, Empirical and Molecular Formulas
The Use of Empirical and Molecular Formulas

UNIT IX: QUANTITATIVE RELATIONSHIPS: THE CHEMICAL EQUATION - 6 hours

In Unit V we learned how to write formulas and name compounds. This unit deals with the combination of chemical formulas into an equation and the stoichiometric relationships in a chemical equation. Topics discussed are:

Chemical Equations
Types of Chemical Reactions
Stoichiometry
Percent Yield
Limiting Reactant
The Nature of Oxidation and Reduction
Balancing Redox Equations: Oxidation State Method
Balancing Redox Equations: The Ion-Electron Method

COURSE OUTLINE
CHM 104
PRINCIPLES OF CHEMISTRY 1
LABORATORY

1. Weighing Operations: Gravimetric Techniques
(includes formula of a hydrate)
2. Identification of a Substance
3. Separation of the Components of a Mixture
4. Chemical Reactions
5. Chemical Formulas
6. A Sequence of Chemical Reactions