SAULT COLLEGE of Applied Arts and Technology Sault Ste. Marie

COURSE OUTLINE

CHM 115-4 GENERAL CHEMISTRY THEORY

revised October, 1979 by J. Korrey 97 1

CHM 115-4 General Chemistry Theory

General Chemistry theory is taught to students in the Chemical Engineering Technician and Medical Laboratory Technology programs in both the first and second semesters. The course consists of four hours per week with three hours being devoted to theory and one hour spent on solving related problems.

CHM 115-4 is taught in the first semester of the program and is a prerequisite for CHM 125-4 which is a continuation of General Chemistry theory in semester 2.

UNIT I - Basic Concepts

The first part of this unit reviews the basic units of measure in the S.I. system and methods of conversion normally encountered in science courses. The latter part describes various methods of separating matter into pure substances and techniques for their eventual identification.

Topics discussed are:

Units of Measure - Length, Volume, Mass and Temperature. Uncertainty in measurements, significant figures, conversion of units, S.I. units.

<u>Kinds of Substances</u> - Identification of pure substances, separation of matter into pure substances by distillation, fractional crystallization and chromatography.

UNIT II - Atoms, Molecules & Ions

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 Laws of Conservation of Mass and Multiple Proportions, Constant Composition.

The Fundamental Particles of the Atom - The Electrons, Protons & Neutrons Atomic No., Mass No., Isotopes

Molecules, Molecular & Structural Formulae

Ions, Atomic Masses, Avogadros No., Molecular Mass.

<u>UNIT III</u> - In Unit II, we discussed the building blocks of matter: atoms, molecules and ions. In Chemistry the structures of substances containing these particles are represented by chemical formulas. This unit deals with different types of formulas and their use in balanced equations.

Topics discussed are:

Chemical Formulae, Nomenclature & Equations - In this unit we discuss:

- simplest & molecular formulae
- obtaining simplest formulae and molecular formulae by analysis
- the use of the mole
- chemical equations & calculations involving mass relations, limiting reagent, theoretical & actual yield.

*Note: In addition to all of these topics a great deal of emphasis is placed on formulae writing, nomenclature and the balancing of equations.

UNIT IV - The Physical Behaviour of Gases

Continuing our study of matter we know pure substances exist as gases, liquids and solids. This unit will be devoted to the study of gases.

Topics discussed are:

- Some general properties of gases
- Methods of measuring pressure
- The gas laws: The Ideal Gas Law
 Boyle's Law
 Charles' & Gay Lussac's Law
 Avogadro's Law
 The combined gas Law
 Dalton's Law of Partial Pressure
- Real Gases
- The Kinetic Theory of Gases
- Graham's Law of Effusion

UNIT V - Liquids and Solids; Phase Changes

In the previous unit, we discussed the laws governing the physical behaviour of gases and the interpretation of these laws in terms of the Kinetic Theory.

In this unit we will discuss the condensed phases of matter - liquids and solids.

Topics discussed are:

- Nature of the liquid state
- Liquid-Vapour equilibrium and the effects of changes in volume and temperature on Vapour Pressure
- Normal Boiling Point, critical temperature and Pressure
- The nature of the solid state This topic is discussed in the modern physics course (PHY 106)
- Phase equilibria: Phase diagrams sublimation fusion

UNIT VI - Solutions

This unit studies the structure and physical properties of solutions which is the necessary background for a discussion of solution chemistry.

Topics discussed are:

- Types of solutions
- Methods of expression of concentration
- Principles of solubility for: liquid-liquid 7 liquid-solid 5 systems gas-liquid
- Effect of temperature and pressure on solubility
- Collegative properties of non-electrolytes
 - Vapour Pressure lowering
 - Boiling Point elevation
 - Freezing Point depression
 - Osmotic pressure

UNIT VII - Water

This unit deals with a study of one of the most abundant and most important resources - Water.

Topics discussed are:

- The Physical properties of water

- Water as a solvent; Electrolyte solutions
- Conductivity of Water solutions
- Natural sources of water

- Water pollution and types of pollutants
- Water purification removal of suspended matter
 - disinfection
 - removal of taste and odor
 - Water softening methods
 - desalination by distillation, reverse osmosis, ion-exchange