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SAULT COLLEGE OF APPLIED ARTS & TECHNOLOGY

SAULT STE. MARIE, ONTARIO

COURSE OUTLINE

COURSE TITLE: PRINCIPLES OF CHEMISTRY I

CODE NO.: CHM 104-4 SEMESTER: I

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

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APPROVED: R Cook/lp 96-05-21

DEAN, SCHOOL OF SCIENCES & NATURAL RESOURCES DATE

IN. OF CHEMISTRY I — CHM 104-4

COURSE NAME — COURSE NUMBER

TOTAL CREDIT HOURS: 64

PREREQUISITE(S): CHM 099 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 lab techniques and lab safety and on report writing will be held during the early weeks of the semester.

II. STUDENT PERFORMANCE OBJECTIVES:

Principles of Chemistry is taught to students in the Environmental gineering, Water Resources and Pulp & Paper Technology programs in th 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 eight hours per two week period, two hours being devoted to theory each week and a three hour lab period alternating weekly with a one hour tutorial.

Upon successful completion of this course the student will be able to:

1. Perform calculations and conversions in both the SI metric and lb, Imperial unit systems.
2. Define key terms used in chemical experiments.
3. Classify matter based on physical and chemical properties.
4. State the basic concepts of the atomic structure of matter.
5. Explain the basis of the classification of elements and the structure of the periodic table.
6. Distinguish between atomic, molecular and ionic substances.

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II. STUDENT PERFORMANCE OBJECTIVES (CONTINUED):

7. Name chemical substances by common name and IUPAC name.

8. Write and balance chemical equations and identify the different types of reactions.

9. Describe the theory of ions in solution, recognize precipitation, acid-base and gas forming reactions and write ionic and non ionic equations.

10. Explain the mole concept and quantify substances in terms of mass and moles.

11. Complete calculations to determine chemical formulas and to determine quantities of substances involved in chemical reactions.

12. Use quantum numbers to describe electrons in an atom.

13. Write and use electron configurations to predict trends in properties of the main group elements in the periodic table.

. Define the terms and distinguish between ionic and covalent bonding.

15. Draw Lewis structures for atoms, molecules and ions.

In a laboratory setting, the student will be able to:

1. Determine the density of an unknown solid and liquid using gravimetric (weighing) techniques.

2. Separate an unknown in nature into its components based on differences in physical properties.

3. Determine the mass percentage of water in a hydrate and calculate the formula of an unknown hydrate.

4. Conduct chemical reactions and identify the products formed from the given reactants.

5. Determine the chemical formula of a compound formed in a chemical reaction based on mass and moles.

6. Recover a mass of a substance which has been subjected to a sequence of chemical reactions.

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III. **TOPICS TO BE COVERED:**

1. Chemistry and Measurement
2. Atoms, Molecules and Ions
3. Chemical Reactions
4. Calculations with Chemical Formulas and Equations
5. Atomic Structure
6. Ionic and Covalent Bonding

IV **LEARNING ACTIVITIES**	**REQUIRED RESOURCES**
1. Chemistry and Measurement	Chapter 1 in Chemistry by Ebbing
1.1 Development of Modern Chemistry 1.2 Experiment and Explanation 1.3 A Review of Significant Figures 1.4 A Review of the International System (SI) of Units 1.5 Derived Units 1.6 Conversion Factors	
2. Atoms, Molecules and Ions	Chapter 2
2.1 Matter 2.2 Atomic Energy 2.3 Periodic Table of the Elements 2.4 Chemical Formulas 2.5 Naming Simple Compounds 2.5.1 Ionic Substances 2.5.2 Molecular Compounds 2.5.3 Acids and Hydrates	
3. Chemical Reactions	Chapter 3
3.1 Chemical Reactions 3.2 Types of Reactions 3.3 Ions in Aqueous Solutions 3.3.1 Electrolytes 3.3.2 Acids and Bases 3.4 Molecular and Ionic Equations 3.5 Reactions in Aqueous Solutions	