douglas college **Course Information**

Division: ACADEMIC DATE: September 13, 1994

Department: SCIENCE & MATHEMATICS New Course: _____

Revision of Course Information form: X

DATED: June 1980

C: CHEM 105 (Subject & Course No.) D: Introductory Chemistry (Descriptive Title) E: 5 (Semester Credit)

F: Calendar Description

This course quickly reviews the content of CHEM 104, including stoichiometry and atomic structure, and then continues with the study of the following topics: thermochemistry, equilibrium, gases and liquids, solution chemistry, properties and reactions of acids and bases, and electrochemistry.

Summary of Revisions:
(Enter date & section)
Ex: Section C,E,F, &R

H,N,O,P

G: Type of Instruction: Hours Per Week/ Per Semester

Lecture	4	Hrs.
Laboratory	3	Hrs.
Seminar		Hrs.
Clinical Experience		Hrs.
Field Experience		Hrs.
Practicum		Hrs.
Shop		Hrs.
Studio		Hrs.
Student Directed Learning		Hrs.
Other		Hrs.

TOTAL 7 HOURS

H: Course Prerequisites:
CHEM 104 (C or better) or Chem 11 (B or better) AND MATH 101 or equivalent.

I: Course Corequisites:

J: Course for which this course is a pre-requisite
CHEM 110

K: Maximum Class Size:
36

L: College Credit Transfer X

College Credit Non-Transfer _____

M: Transfer Credit:
Requested ___
Granted X
Specify Course Equivalents or Unassigned Credit as Appropriate

U.B.C. (with CHEM 110) CHEM 103
S.F.U. CHEM 101 and 106
U. Vic. CHEM 101
OTHER:

COURSE DESIGNER(S)

DIVISIONAL DEAN

DIRECTOR/CHAIRPERSON

REGISTRAR

N: Textbooks and materials to be purchased by students
(Use Bibliographic Form):

Kotz, J.C., Joesten, M.D., Wood, J.L. and Moore, J.W., *The Chemical World: Concepts and Applications;* Saunders College Publishing, Toronto, 1994.

Chemistry 105 Laboratory Manual, Douglas College.

Complete Form with Entries Under the Following Headings:

O. Course Objectives; P. Course Content; Q. Method of Instruction;

R. Course Evaluation

O. **General Course Objectives**

The student will be able to:

1. Express the precision of a calculated quantity given the uncertainties in the measurements used in the calculation.

2. Given the mass of a substance, calculate the number of moles, and the number of particles in the sample.

3. Given the percent composition of a compound and the molar mass, find the empirical and molecular formulas.

4. Given the balanced equation for a chemical reaction, carry out the required stoichiometric calculations. The substances in the reaction may be gases, solids, liquids, or solutions.

5. Define any of the terms used in the course, for example: mole, specific heat capacity, ideal gas, colligative property etc.

6. Carry out thermochemical calculations based on data obtained in calorimetric measurements.

7. Use thermochemical tables to calculate ΔH, ΔS, or ΔG for a given chemical reaction.

8. Solve problems involving gases, assuming ideal gas behavior.

9. Describe the Kinetic Molecular Theory of Gases and use this to explain any of the observed properties of gases.

10. Given the solubility of ionic compounds in water, write the net ionic equation for any reaction occuring in aqueous solution.

11. Perform calculations involving any of the three colligative properties of solution: freezing point depression, boiling point elevation, and osmotic pressure.

12. Use the Principle of Le Chatelier to predict the direction of change in a system in equilibrium as the result of a given change in temperature, pressure, or volume of the system.

13. Solve problems involving the use of the concentration equilibrium constant, K_c, for gaseous systems.

14. Write balanced equations for all reactions or equilibria involving acids and bases.

15. Calculate the pH of a given solution of any strong acid or base.

16. Calculate the pH and percent ionization of a solution of given concentration of a weak acid or base (or the salt of a weak acid or base).

17. Explain how buffer solutions are prepared and describe their properties.

18. Given the concentration and volume of a strong acid which is titrated with a given concentration of strong base, calculate the initial pH, and the pH after the addition of various volumes of the base.

19. Balance any redox reaction.

20. For any given galvanic cell, write the cell reaction equation and calculate the standard cell emf.

21. Use tables of standard electrode potentials to predict reaction spontaneity for a given redox reaction.

22. Do calculations of reactants consumed, products formed etc for a given electrolytic cell.

P. Course Content

1. Introduction and Review

Measurement, problem-solving, formulas and calculations, chemical reactions, stoichiometry.

2. Principles of Reactivity: Thermodynamics

Enthalpy, calorimetry, Hess's Law, standard enthalpies of formation and reaction, entropy.

3. Principles of Reactivity: Kinetics and Equilibrium

Rates of chemical reactions, chemical equilibrium, the equilibrium constant, calculations involving K, Le Chatelier's Principle, chemical reactivity.

4. **Gases and Liquids**

Gases: review of the gas laws, the ideal gas equation, Dalton's Law of Partial Pressures, Kinetic Molecular Theory, Graham's Law of Effusion, real gases. Liquids: properties, vaporization and condensation, vapour pressure.

5. **Solution Chemistry**

Definitions, the solution process, Henry's Law, concentration units, colligative properties: boiling point elevation, freezing point lowering, osmotic pressure. Aqueous solutions: solubility product, common ion effect.

6. **Properties of Acids and Bases**

Properties, definitions, conjugate acid/base pairs, autoionization of water, relative acid strengths, K_a and K_b, salts and hydrolysis, buffers, acid-base titrations.

7. **Electrochemistry**

Redox reactions, oxidation numbers, balancing redox equations. Electrochemical cells, standard cell emf, using standard cell potentials, batteries, fuel cells, and corrosion. Electrolysis.

Laboratory Content

The following laboratory experiments will be performed during the lab period:

1. Analytical balance and metric conversions.
2. Density measurements
3. Acid-Base Titrations
4. Thermochemistry
5. Redox: Determination of Water of Hydration
6. Chemical Equilibrium
7. Ideal Gas Constant
8. Freezing Point Depression
9. Acid Dissociation Constant
10. Electrochemistry

R. Evaluation

The student's performance in the course will be based on the following evaluations:

1. Lecture Material (70%)

(a) Two or three in-class tests will be given during the semester (30%).

(b) A final exam covering the entire semester's work will be given during the final examination period (30%).

(c) Problem assignments/quizzes (10%).

2. **Laboratory (30%)**

(a) Written reports for each experiment will be handed in and graded. These reports will either be complete reports, to be handed in in the laboratory notebook, or short reports, to be handed in on report sheets (20%).

(b) Quantitative results of experiments performed on unknown samples will be graded (2%).

(c) A practical laboratory exam will be given in the last lab period of the semester (8%).