douglas college

Course Information

A: Division: Instruction Division

B: Dept.: Science & Technology

Program:

Date: 18 November 1998

New Course: x

Revision of Course Information form:
Dated:

C:	D:	E:
CHEM 108	Introductory Chemistry	4
Subject & Course No.	Descriptive Title	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, acids and bases, redox reactions, and several examples of descriptive chemistry.

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

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

Lecture\Practice:	4	Hrs.
Laboratory:	2	Hrs.
Seminar:		Hrs.
Clinical Experience:		Hrs.
Field Experience:		Hrs.
Practicum:		Hrs.
Shop:		Hrs.
Studio:		Hrs.
Student Directed Learning:		Hrs.
Other:		Hrs.
Total:	6	Hrs.

H Course Prerequisites:
CHEM 104 (C or better) or CHEM 11 (C or better) AND Math 101 or equivalent

I: Course Corequisites:
NIL

J: Course for which this Course is a Prerequisite:
CHEM 110

K Maximum Class Size:
36

L:

College Credit Transfer	x
College Credit Non-Transfer	
Non-Credit	

M Transfer Credit: Requested: x
Granted:

Specify Course Equivalents or Unassigned Credit as appropriate:

U.B.C. (with CHEM 110 and 205) CHEM 111/112
S.F.U. CHEM 101 and 106
U. Vic. CHEM 101
Other:

*Course Designer(s)

Dean

Vice-President, Instruction

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 108 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.

6. Define any of the terms used in the course, for example: mole, specific heat capacity, ideal gas, Le Chatelier's Principle, etc.

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

8. Use thermochemical tables to calculate ΔH, ΔS for a given chemical reaction.

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

10. 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.

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

12. Write balanced equations for all reactions of equilibria involving acids and bases.

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

14. 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).

15. 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.

16. Balance any redox reaction.

17. Explain, in terms of fundamental chemical principles, three of the following industrial processes: sodium by electrolysis, chlorine and sodium hydroxide, aluminum production, magnesium from the sea, metals and their ores, fractionation of air, the atmosphere, pollutants, sulfur.

P. Course Content

Scientific Measurement - Review

Basic SI units, conversion factors, accuracy and precision in scientific measurement, types of errors, uncertainty, significant figures and calculations.

Atoms, Molecules and Ions - Review

Models of the atom, fundamental atomic particles, and isotopes. Molecular and empirical formulas, percentage composition, mole and molar mass. Naming of ionic, molecular and organic compounds.

Stoichiometry Review

Balancing chemical equations and reaction classification. Theoretical and actual yields, limiting reagents, required mass of reagents. Molarity and dilution. Principles of titration.

Thermochemistry

Forms of energy, definition of heat, heat capacity and specific heat calculations. Energy transfers and changes of state. Heats of reaction and experimental determination via calorimetry. Enthalpy and the First Law of Thermodynamics. Hess's Law and standard enthalpies of formation. Randomness and disorder in a system - Entropy.

Chemical Equilibrium

Rates of chemical reactions and the difference between kinetic and thermodynamic stability. The concept and characteristics of a chemical equilibrium. The meaning of the equilibrium constant, K, uses and manipulation. Use and application of Le Chatelier's Principle to chemical equilibrium.

Liquids

Properties of Liquids. Vaporization.

Gases, Intermolecular Forces

Historical development and analysis of the three Simple Gas Laws (Boyle's, Charles", and Avogadro's). Pressure units, conversions, and devices for measuring pressure. Statement of the ideal gas law and various calculations. Dalton's Law of partial pressure and its application.

Acids and Bases (Chapter 16)

Bronsted-Lowry definition of acids and bases. Conjugate acid/base pairs, amphiprotic substances, and examples of strong and weak acids and bases. The autoionization of water, the K_w expression and the pH scale. Mathematical definition of K_a and K_b for acids or bases, their meaning and calculations involving them. Salt hydrolysis and calculations including the common ion effect.

Redox

Definitions of oxidizing and reducing agents, oxidation numbers and balancing redox equations.

Descriptive Chemistry selected topics from the following:

Noble gases, industrial applications: sodium by electrolysis, chlorine and sodium hydroxide, aluminum production, magnesium from the sea, metals and their ores, fractionation of air, the atmosphere, pollutants, sulfur (8 hours)

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 (75%)

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) Any or all of the following evaluations, at the descretion of the instructor: problem assignments, quizzes, class participation [5% maximum](15% in total)

2. Laboratory (25%)

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 (18%)

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

c) A practical laboratory exam will be given in the last period of the semester (5%)