CAMOSUN COLLEGE * CHEMISTRY & GEOSCIENCE DEPARTMENT

Winter Semester 2005 ***Chemistry 110*** ***Section 003***

GENERAL COLLEGE CHEMISTRY 1

Course Description

The first part of a college level package for students in the life sciences and non-science programs. The topics comprise chemical energetics, chemical equilibrium, acids and bases, and oxidation/reduction chemistry. (T)

Semester offered:	Winter
Credits:	4 credits
In-class workload:	3 h of lectures per week
	3 h laboratory period per week
Estimated out-of-class workload:	6 h per week
Number of weeks:	14 weeks
Pre-requisites:	Chem 060 or Chem 11

Intended Learning Outcomes

At the end of this course students will be able to

1. *Identify, describe and account for the general characteristics of gases, liquids and solids - interionic and intermolecular forces; vaporization and condensation; melting and freezing; specific characteristics of water.*
2. *Utilize solution terminology, account for and compare the solubilities of ionic and molecular compounds, and describe the impact of temperature and pressure on solubility.*
3. *Describe the characteristics of solubility equilibria and use mathematical techniques employed in dealing with this phenomenon.*
4. *Describe and account for the colligative and osmotic properties of aqueous solutions.*
5. *Account for differences in the rates of chemical reactions, apply Le Chatelier's Principle to equilibrium processes, and explain how catalysts influence reaction rates.*
6. *Apply mathematics and equilibrium constant expressions to descriptions of reversible reactions and chemical equilibria.*
7. *Identify Arrhenius, Bronsted and Lewis acids and bases, and describe the chemical properties of each type of substance.*
8. *Describe the ionization of water, the pH scale, weak and strong acids and bases, neutralization and the actions of buffer solutions.*
9. *Perform mathematical calculations involving pH, hydronium ion concentrations and acid-base titrations.*
10. *Define oxidation and reduction and assign oxidation numbers to the elements of substances involved in oxidation-reduction reactions. Demonstrate the ability to use oxidation numbers in balancing redox reactions.*
11. *Demonstrate an understanding of electrochemistry and account for the characteristics and uses of the standard hydrogen electrode, standard reduction potentials, electrolytic and voltaic cells.*

Instructor

Jamie Doran, Ph.D.
Office: Room 350A, Fisher Building, Lansdowne Campus
Telephone: 370-3438
E-mail: jdoran@camosun.bc.ca
Fax: 370-3417
Office hours: Regular office hours are posted on the office door.
These are:
Monday, 11:30 to 12:00
Tuesday, 11:30 to 1:20
Wednesday, 11:30 to 1:20
Thursday, 11:30 to 12:00
Students are welcome whenever the door is open.
Appointments may be made to meet at other times.
Office hours will be extended before exam times.

Course times and locations

Lecture times: Monday
2:30 PM to 3:20 PM
Fisher Building, Room F210

Wednesday
2:30 PM to 3:20 PM
Fisher Building, Room F214

Thursday
2:30 PM to 3:20 PM
Fisher Building, Room F212

Laboratory Period: Friday (see schedule below)
12:30 AM to 3:20 PM
Fisher Building, Room F300

Textbook (Required)

Fundamentals of Chemistry. Fourth Edition. 2003. Au. Ralph A. Burns. Prentice-Hall Education Inc., Upper Saddle River, NJ, USA.

Laboratory Manual (Required)

Chemistry 110 Lab Manual. May, 2002 Edition. Department of Chemistry & Geoscience, Camosun College. Camosun College Press. Victoria. BC

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General Materials and Supplies Required by Students

Safety glasses Safety glasses are required when handling hazardous chemicals or biochemicals. The students are required to purchase their own pairs of glasses. Students lacking safety glasses will not be permitted to work in the laboratory.

Lab coats Lab coats are required for any experiments involving hazardous chemicals. Students are required to provide their own lab coats. Students lacking lab coats when required will not be permitted to work in the laboratory.

Latex gloves Latex or similar gloves will be available in the lab and are to be used when appropriate to protect the skin from hazardous chemicals.
*If you have any chemical allergies make this known to the instructor at the very beginning of the course.

Scientific calculators
Calculators may be required in the lab, in class, and during exams.
Students are required to provide their own calculators.

Course evaluation

Attendance for tests and exams is mandatory. If a quiz or exam is missed due to illness or for another justifiable reason (submitted in writing), a make-up test may be scheduled, or the value of that test may be added to the value of the final exam.

Test #1 This test will cover lecture material from approximately the first third of the course. The delineation of material that students will be responsible for on this test will be provided in class about one week before the date of the test.
This 90 min. test will be written on **Friday, February 18th** beginning at 12:30 PM.
The value this exam contributes to the final grade is **20%.**

Test #2 This test covers relevant material from the middle portion of the course, and excludes topics covered on Test #1. The delineation of material that students will be responsible for on this exam will be provided in class about one week before the date of the exam.
This 90 min. test will be written on **Friday, March 18th** beginning at 12:30 PM.
The value this exam contributes to the final grade is **20%**.

Laboratory Reports These will compose **15%** of the final grade. Each lab report will have equal value in terms of its contribution to the final grade. Students **must attend** the laboratory portion of the course. Students **must pass** the laboratory portion of the course in order to pass the course. For more information including a lab schedule see below.

Final Exam The final exam is a comprehensive exam. The value this exam contributes to the final grade is **45%**. The time and location of the final exam will be posted by the College.

Grade scale

The percentage marks for the course will be converted to grades according to the following scale established by the School of Arts & Science.

A+	= 95% to 100%	B-	= 70% to 74%
A	= 90% to 94%	C+	= 65% to 69%
A-	= 85% to 89%	C	= 60% to 64%
B+	= 80% to 84%	D	= 50% to 59%
B	= 75% to 79%	F	= 0% to 49%

Lecture Outline

1. **Fundamental Background Knowledge** *(A brief review of salient material from Chapters 1 to 12 that typically form part of Chem 060 or Chem 11)*

   Atomic Structure

   Atomic Number & Atomic Mass

   Isotopes

   Groups & Trends Represented in the Periodic Table

   Electron Configurations

   Ions & Ionic Bonding

   Molecules & Covalent Bonding

   Electronegativity & Molecular Geometry and Polarity

   Moles

   Stoichiometry

   Heat & Chemical Reactions

2. **Liquids and Solids.** (*Chapter 13*)

   13.1 Some Generalizations on Gases, Liquids & Solids

   13.2 Interionic and Intermolecular Forces

   13.3 The Liquid State

   13.4 Vapourization & Condensation

   13.5 The Solid State

   13.6 Melting & Freezing

   13.7 Heating & Cooling Curves

   13.8 Water: A Most Unusual Liquid

3. **Solutions** (*Chapter 14*)
    - 14.1 What is a Solution?
    - 14.2 Solubility Terminology
    - 14.3 The Solubility of Ionic Compounds
    - 14.4 The Solubility of Covalent Compounds
    - 14.5 Solubility Equilibria
    - 14.6 Effects of Temperature & Pressure on Solubility
    - 14.7 Solution Concentration Expressions
    - 14.8 Colligative Properties of Solutions
    - 14.9 Colloids
    - 14.10 Osmosis & Dialysis

4. **Reaction Rates and Chemical Equilibrium.** *(Chapter 15)*
    - 15.1 Reaction Rates: Collision Theory
    - 15.2 Factors That Control Reaction Rates
    - 15.3 Reversible Reactions and Equilibrium
    - 15.4 Le Chatelier's Principle
    - 15.5 The Effect of a Catalyst on a System
    - 15.6 The Equilibrium Constant Expression

5. **Acids and Bases**. (*Chapter 16*)
    - 16.1 Acids & Bases: The Arrhenius Theory
    - 16.2 Strong and Weak Acids
    - 16.3 Strong and Weak Bases
    - 16.4 Reactions of Acids
    - 16.5 Reactions of Bases
    - 16.6 Bronsted-Lowry Definitions of Acids & Bases
    - 16.7 Lewis Definitions of Acids & Bases
    - 16.8 The Self-Ionization of Water
    - 16.9 The pH Scale
    - 16.10 Hydrolysis: Salts in Water
    - 16.11 Buffers: Controlling the pH
    - 16.12 Acid-Base Titrations

6. **Oxidation & Reduction**. *(Chapter 17)*

    17.1 Oxidation Numbers: A Review

    17.2 Oxidation & Chemical Properties of Oxygen

    17.3 Reduction & Chemical Properties of Hydrogen

    17.4 Some Important Oxidizing Agents

    17.5 Some Important Reducing Agents

    17.6 Oxidation & Reduction Half-Reactions

    17.7 Electrolytic Cells

    17.8 Voltaic Cells

For each section of the course, a list of appropriate practice questions from the course text will be provided along with an additional set of practice questions.

Laboratory Outline

Students **must pass the laboratory section** of the course in order to pass the course as a whole.

Attendance in the laboratory section of the course is **mandatory**. No laboratory session can be missed without an acceptable reason submitted in writing (e.g. a note from medical doctor).

All experiments described in the lab manual will not be conducted due to time constraints. The schedule of the experiments to be conducted is provided below.

Laboratory reports are due in the following experimental lab period. Often it will be sufficient to hand in the completed pages taken directly from the lab manual. Each lab partner must hand in a separate report although each person should share equally in the work. On some occasions a formal laboratory report may be required. If so, guidelines for the preparation of a formal report will be provided. If a lab is missed, students are expected to collect the data from another member of the class and prepare and submit material as if one had attended that lab.

Laboratory Schedule

week 1	Friday, January 14	lab orientation
week 2	Friday, January 21	Expt. 1. Energy Changes
week 3	Friday, January 28	Expt. 2. Reaction Rate
week 4	Friday, February 4	Expt. 3. Shifting Equilibria
week 5	Friday, February 11	reading break

week 6	Friday, February 18	Test #1
week 7	Friday, February 25	Expt. 4. Precipitation Reactions
week 8	Friday, March 4	Expt. 5. Qualitative Analysis
week 9	Friday, March 11	Expt. 6. Acid-Base Titrations
week 10	Friday, March 18	Test #2
week 11	Friday, March 25	Good Friday, Easter Holiday
week 12	Friday, April 1	Expt. 8. Acid-Base Titration Curves
week 13	Friday, April 8	Expt. 10. Oxidation-Reduction Reactions & Expt. 11. Oxidation of Iron
week 14	Friday, April 15	Review