CAMOSUN COLLEGE
School of Arts & Science
Chemistry/Geoscience Department

Chem 121-03 (Winter 2004) Course Outline

Instructor Information

Instructor: Dr. Becky Chak
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Office hours: Mon - Thursday 5:30 - 6:15 pm or appointment by E-mail.

Intended Learning Outcomes

Please refer to the Approved Course Description Attached.

Required Course Materials

- *CHEMISTRY: the Central Science* 9th Edition", *Brown, Lemay, and Bursten*
- *Chemistry 120 Lab Manual, Camosun College (Safety Glasses and lab coat recommended)*

Recommended Course Materials

- *Solutions to Exercises in "CHEMISTRY: the Central Science* 9th Edition" by *Brown, Lemay, and Bursten.*
- ***Note: the above material is also available on a two-hour loan in the Library Reserve Room for Chem 120 and 121.***

Course Structure

1. Lecture: Monday 6:30 - 9:20 pm (F302);
2. Lab: Wednesday 6:30 - 9:20 pm (F356);
3. Problem Sets on each section of the course[1] (see p. 4);
4. **TWO Term Tests[2] (two hours each; to be written during lab period on February 11, March 17);**
5. Final Examination (Three-hour in April); on **all material** in the course.

Note

1. Practice problems are assigned from the textbook. Short answers are available at the end of the text. Detailed solutions are available in the ***Solutions Manual*** for the text. Students should attempt them to keep pace with the material and seek assistance from the instructor should questions arise.
2. Test 1 will be on Review material from BLB Ch. 2 - 4 & Gases (Ch. 10); Test 2 will be on BLB Ch. 6, 7 & 8.

Basis of Student Assessment

Laboratory (8 experiments)	20%
Test 1(Review & Gases)	15%
Test 2(Ch. 6, 7 & 8)	20%
Final Exam	45%

Important Note

1. You must hand in a **minimum** of SIX lab reports (i.e., 75 % of the lab work) and score a **minimum** of 50% on lab marks to be permitted to write the final examination.
2. You must obtain a passing grade in both the lecture and laboratory portion of the course in order to pass the course.
3. Students must write each test as scheduled. No one is allowed to write late and there will be NO make-up test (NO EXCEPTIONS).
4. Any missed test will result in its weight being automatically redistributed to the final exam. If it is advantageous to the student, the theory mark will be solely derived from the final examination.
5. **Missed Final Examination** will be **COUNTED AS ZERO** unless a medical or other satisfactory reason is provided in writing to the instructor within 3 days of the date of the examination.

Letter Grades

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

Important Dates

- February 11 (Wednesday): Test 1
- February 12 and 13: Reading Break
- March 8 (Monday): Last Day to Withdraw…
- March 17 (Wednesday): Test 2
- April 8: Last Day of class for Winter 2004
- April 13- 17& 19 - 21: Exam Period for Winter 2004

Tentative Lecture Plan

1. January 7, 12, 19: Review of selected topics (9 hours)

- Atomic weights & isotopes; the Mole & Molar mass; Molecular Weight & Formular Weight; Empirical & Molecular Formulas; Chemical Analysis of Mixtures.
- Chemical Equations: Balancing Chemical Equations, Net ionic equations; Quantitative Information from Balanced Equations, Limiting Reagents, Percent Yield.
- Reactions of elements & compounds with O_2.
- Reactions in Solution: solution concentration, dilution, solution stiochiometry.
- Reactions of Ionic compounds with water: strong & weak electrolytes, solubility of ionic compounds with water, precipitation reactions.
- Acid-Base Reactions: definition, Neutralization & Titrations. Acid-Base reactions with Gas evolutions.
- Oxidation-Reduction Reactions: definition, oxidation numbers, oxidizing & reducing agents, balancing redox reactions, redox titrations.
- ***Text: Chapters 2 - 4***

2. January 26, February 2: Gases (6 hours)

- Characteristics of Gases.
- The Gas Laws: Boyle's Law, Charles's Law, Gay-Lussac & Avogradro's Law.
- Ideal Gas Law & its Applications. Gas Law & Stoichiometry.
- Gas Mixtures & Dalton's Law of Partial Pressures.
- Kinetic Molecular Theory of Gases: Molecular Speeds; Molecular Effusion & Diffusion.
- Non-ideal Gases.
- ***Text: Chapter 10***

3. February 9, 16: Electronic Structure of Atoms (6 hours)

- Light & Electromagnetic Radiation; Quantum Theory; Photoelectric effect & the dual properties of light.
- Atomic Line Spectra & Bohr's Model. de Broglie's equation, Heinsenberg Uncertainty Principle.
- Quantum Mechanical View of an atom: Schrodinger Equation, wavefunction & atomic orbitals; Quantum Numbers & Atomic orbitals, Shapes of atomic orbitals.
- Many-electron atoms; electron spins; Pauli Exclusion Principle; Hund's Rule. Electron configurations of elements & ions.
- ***Text: Chapter 6***

4. February 11 (Wednesday): Test 1 (2 hours in lab period)

- Examinable topics: Review materials & Gases (BLB Ch. 2 - 4 & 10)

5. February 23: Periodic Properties of the Elements (3 hours)

- Periodic Table: Historical development, Groups, metals, non-metals, metalloids.
- Atomic Properties & their periodic Trends: Atomic Size, Ionization energy, electron affinity.
- Ions & Ionic radii, common ions.
- ***Text: Chapter 7(sections 7.1 - 7.6)***

6. March 1: Basic Concepts of Chemical Bonding (3 hours)

- Valence electrons & Lewis Symbols. Ionic & Covalent bonding.
- Lewis Structures; Octet rule; formal charges, resonance structures.
- Strength of covalent bonds: bond lengths, bond dissociation energies.
- ***Text: Chapters 8***

7. March 3 (Wednesday), 8: Molecular Geometry & Bonding Theories (6 hours)

- Shapes of molecules & VSEPR model.
- Bond polarity, electronegativity, Molecular polarity, dipole moments.
- Valence bond theory: hybrid orbitals, multiple bonds, delocalised π bonds.
- Molecular orbital theory: MO diagrams of homonuclear diatomics, bond order.
- ***Text: Chapter 9***

8. March 15: Intermolecular forces, Liquids & Solids(3 hours)

- General Properties of Liquids & Solids.
- Intermolcular forces; Types of solids.
- ***Text: Chapter 11 (sections 11.1 - 11.5, 11.7, 11.8)***

9. March 17 (Wednesday): Test 2 (2 hours in lab period)

- Examinable topics: BLB Ch. 6 - 8

10. March 22: Properties of Solutions (3 hours)

- Intermolecular forces & and the solution process.
- Saturated Solutions & solubility. Factors affecting solubtilities.
- Colligative Properties: freezing point depression & boiling point elevation. Osmosis.
- ***Text: Chapter 13***

11. March 29: Chemistry of the enviroment (3 hours)

- ***Text: Chapter 18***

12. April 5: Review & Examination Information

Note: Due to time constraints, we may not be able to cover all the topics listed above. Additional Information & Review Exercises will be given before scheduled tests and examination.

Problem Sets

	End-of-Chapter Exercises from the textbook, "Chemistry, The Central Science" 9th edition by Brown, LeMay & Bursten.
Chapter 25: Organic Chemistry	25.7, 25.11, 25.13, 25.15, 25.17, 25.19, 25.21, 25.23, 25.27, 25.35, 25.37, 25.39, 25.41, 25.49, 25.51, 25.55, 25.57, 25.59, 25.67, 25.75, 25.78, 25.80, 25.83
Chapter 14: Chemical Kinetics	14.1, 14.5, 14.7, 14.11, 14.13, 14.15, 14.17, 14.19, 14.23, 14.25, 14.33, 14.37, 14.39, 14.43, 14.45, 14.47, 14.53, 14.55, 14.57, 14.61, 14.65, 14.73, 14.80, 14.84, 14.87
Chapter 15: Chemical Equilibrium	15.1, 15.3, 15.7, 15.9, 15.11, 15.13, 15.17, 15.19, 15.23, 15.25, 15.27, 15.29, 15.31, 15.33, 15.35, 15.37, 15.39, 15.43, 15.45
Chapter 5: Thermochemistry	5.11, 5.13, 5.17, 5.19, 5.25, 5.29, 5.33, 5.41, 5.49, 5.51, 5.57, 5.59, 5.61, 5.63, 5.67, 5.71, 5.75, 5.85
Chapter 19: Chemical Thermodynamics	19.1, 19.5, 19.17, 19.19, 19.23, 19.25, 19.29, 19.31, 19.37, 19.39, 19.41, 19.45, 19.49, 19.51, 19.53, 19.61, 19.63, 19.65, 19.67
Chapter 16: Acid-Base Equilibrium	16.5, 16.7, 16.9, 16.11, 16.15, 16.19, 16.21, 16.23, 16.27, 16.33, 16.35, 16.41, 16.43, 16.45, 16.49, 16.51, 16.55, 16.63, 16.65, 16.67, 16.69, 16.71, 16.73, 16.75
Chapter 17: Additional Aspects of Aqueous Equilibria	17.3, 17.9, 17.13, 17.15, 17.17, 17.19, 17.21, 17.23, 17.25, 17.29, 17.31, 17.37, 17.41, 17.45, 17.55, 17.65
Chapter 20: Electrochemistry	20.3, 20.7, 20.9, 20.13, 20.23, 20.27, 20.33, 20.41, 20.45, 20.47, 20.49, 20.55

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APPROVED COURSE DESCRIPTION

Education Council Approved: June 2003
date

1. Course Abbreviation, Number & Title

(Title is limited to 30 characters.)

CHEM 120 College Chemistry 1

2. Calendar Description

(Brief statement of the purpose and description of the course.) (Limited to 50 words.)

For both university and technology students, this course starts with atomic structure and periodic properties and leads to a discussion of chemical bonding, thermochemistry, molecular structure, intermolecular structure, intermolecular forces and their role in environmental issues. The experiments include chemical synthesis and analysis by titration and spectroscopy.

3. Pre-requisites

(A requirement that must be met before entry into this course.)

Chemistry 12

4. Co-requisites

(A course that must be taken at the same time as this course.)

5 Pre/Co-Requisite

(A course that must be taken either at the same time or before this course.)

6. Credits (if applicable) 4

7. Mode and Hours of Delivery (select ✓ those that are available)

[✓] Direct Instruction **(show hrs/week)**

classroom [3 hr];lab [3 hr]; seminar [0 hr]; practicum [0 hr]; estimated out-of-class [6 hr]

number of weeks [14]

[ ] Distributed Education (on-line, web based)

[ ] Self-Paced

8. Is Prior Learning Assessment (PLA) available for this course? Yes

PLA Assessment will include but may not be restricted to: personal profile and portfolio; work products or artifacts; performance evaluation (oral performance examination); and documented learning from life and work experiences and accomplishments.

9. Intended Learning Outcomes

(If any changes are made to this part, changes must also be made on the Course Outline)

At the end of the course the student will be able to:

1. Utilize nomenclature rules to name ionic and covalent compounds
2. Demonstrate an understanding of stoichiometry by balancing chemical equations and performing mathematical calculations involving chemical reactions.
3. Describe the electronic structure of any atom in the periodic table and apply it to explain many of the physical and chemical properties of the elements.
4. Utilize simple bonding theories to explain why elements combine to form the compounds they do and also to explain many of the properties of compounds.
5. Apply knowledge of intermolecular interactions to rationalize many important physical properties of bulk matter in the gas, liquid and solid phases.
6. Use standard chemistry lab equipment, including burets, pipets, Buchner filters, and volumetric glassware in the correct manner.
7. Perform many standard laboratory procedures, such as titrations, preparation of standard solutions, the preparation, isolation, and purification of compounds, as well as use spectrophotometers to make analytical measurements.

10. Grading System (select ✓ one)

(If any changes are made to this part, changes must also be made on the Course Outline)

[✓] Letter Grades

[ ] Mastery

[ ] Practicum

Refer to Curriculum Approvals Handbook or College Calendar for specific information regarding these systems.

Approved:	Nasr Khalifa Chair	April 28, 2003 Date	D. Knapton Dean	May/03 Date