CAMOSUN COLLEGE
School of Arts & Science
Chemistry/Geoscience Department

Chem 121-01 (Spring 2004) Course Outline

Instructor Information

Instructor: Dr. Becky Chak
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Office hours: Mon & Wednesday: 1:30 - 2:30 pm; Tuesday & Thursday: 10:30 - 11 am 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 121 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.*
- *The Essentials of Organic Chemistry, George, Field and Hambley*
- ***Note: the above materials are also available on a two-hour loan in the Library Reserve Room for Chem 120 and 121.***

Course Structure

1. Lecture: Monday, Wednesday & Friday 11:30 am - 1:20 pm (F302);
2. Lab: Tuesday & Thursday 11:30 am - 2:30 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 May 20, June 3);**
5. Final Examination (Three-hour in the week of June 21) 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 Organic Chemistry; Test 2 will be on Chemical Kinetics & Chemical Equilibrium. Additional Information will be given before scheduled tests and examination.

Basis of Student Assessment

Laboratory (7 experiments)		20%
Test 1 (Organic Chemistry)		20%
Test 2 (Chemical Kinetics and Chemical Equilibrium)		20%
Final Exam (on all the material)	40%	

Important Note

1. You must hand in a **minimum** of SIX lab reports 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 working 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 %		

How your marks will be calculated for students that pass both the lab & lecture portions (i.e. achieve 50% in the lab & 50% in the lecture):

1. For students completed both tests & final exam:

(0.2)(% lab score) + 0.2 (% test 1 score) + 0.2 (% test 2 score) + 0.4(% exam score) = Q1 %
(0.2)(% lab score) + 0.2 (% test 1 score) + 0.6(% exam score) = Q2 %
(0.2)(% lab score) + 0.2 (% test 2 score) + 0.6(% exam score) = Q3 %
(0.2)(% lab score) + 0.8 (% exam score) = Q4 %
Compare Q1, Q2, Q3 & Q4, a student is assigned the highest of the four as the final course grade.

2. For students completed test 1 & final exam:

(0.2)(% lab score) + 0.2 (% test 1 score) + 0.6 (% exam score) = Q1 %
(0.2)(% lab score) + 0.8 (% exam score) = Q2 %
Compare Q1 & Q2, a student is assigned the higher of the two as the final course grade.

3. For students completed test 2 & final exam:

(0.2)(% lab score) + 0.2 (% test 2 score) + 0.6(% exam score) = Q1 %
(0.2)(% lab score) + 0.8 (% exam score) = Q2 %
Compare Q1 & Q2, a student is assigned the higher of the two as the final course grade.

4. For students who completed only the final exam:

(0.2)(% lab score) + 0.8 (% exam score) = Q %

Important Dates

- May 10: Tuition fees due for Spring term 2004
- May 20 (Thursday): Test 1
- June 2 (Wednesday): Last Day to Withdraw…
- June 3 (Thursday): Test 2
- June 18 (Friday): Last Day of class for Spring 2004
- June 21 - 23 : Exam Period for Spring 2004

Tentative Lecture Plan

1. May 3, 5, 7, 10, 12, 14: Organic Chemistry (11 hours)

- Hydrocarbons: alkanes, alkenes, alkynes and aromatics.
- Nomenclature. Structural isomerism, stereoisomers, *Z/E* nomenclature.
- Chemical properties of hydrocarbons. Addition reactions to alkenes and Markovnikov's rule. Aromatic substitution.
- Function groups chemistry including alcohols, ethers, aldehydes, ketones, carboxylic acids, esters, amines, amides and alkyl halides. Synthesis, properties and chemical reactivity.
- Chirality, enantiomers, Cahn-Ingold-Prelog nomenclature.
- Overview of structures of biological compounds (e.g., amino acids, proteins, carbohydrates) & organic polymers.
- **BLB Ch. 25 (25.1 - 25.11; skip p. 998 -999); Ch. 12 (p. 456 - 458);**
- **Essentials of Organic Chemistry: Ch. 1 (p.1 - 32; p. 36 - 41; exclude Mechanisms of addition reaction in alkenes and alkynes; mechanisms of aromatic substitution reaction); Ch. 2 (p. 56 - 58, p. 65 - 70; p. 75 - 76; p. 79 - 82; p. 89 - 91; p. 104 - 107; p. 110 - 112, p. 148 - 151; p. 154 - 156; exclude the formation of alkoxides)**

2. May 17, 19, 21: Kinetics (6 hours)

- Reaction rates, measuring reaction rates, factors influencing reaction rates.
- Rate laws, determining the rate law, method of initial rates, order of reaction.
- Integrated rate laws for first and second order reactions, half-life.
- Temperature and rate, models for chemical kinetics, collision theory, activated complex theory. Arrhenius equation, Arrhenius parameters.
- Reaction mechanisms, rate-determining step, deducing the rate law from the mechanism.
- Catalysis, enzymes, industrial catalysis, ozone depletion.
- ***BLB Chapter 14 (skip p.552 - 554)***

3. May 20 (Thursday): Test 1 (2 hours in lab period)

- Examinable topic: Organic Chemistry

4. May 26, 28: Chemical equilibrium (4 hours)

- Equilibrium condition, K_c, K_p, heterogeneous equilibria, reaction quotient, relation between K_p and K_c.
- Calculating unknown equilibrium concentrations and/or equilibrium constants.
- LeChatelier's principle, the Haber process.
- ***BLB Chapter 15***

5. May 31, June 2, 4, 7, 9, 11: Thermochemistry and Chemical Thermodyamics (12 hours)

- Nature of energy, first law of thermodynamics, enthalpy, enthalpy of reaction.
- Calorimetry, bomb calorimeter.
- Hess's law, enthalpy of formation.
- Spontaneous processes, reversible and irreversible processes.
- Entropy and 2nd law of thermodynamics, molecular interpretation of entropy.
- 3rd law of thermodynamics and absolute entropies, calculating entropy changes.
- Gibbs free energy, standard free energy.
- Free energy and temperature and equilibrium, free energy and work, driving non-spontaneous

processes.
- ***BLB Chapters 5 and 19***

6. June 3 (Thursday): Test 2 (2 hours in lab period)
- Examinable topic: Chemical Kinetics & Chemical Equilibrium

7. June 14, 15, 16, 17: Acids and Bases and Aqueous Equilibria (8 hours)
- Nature of acids and bases, Arrhenius and Bronsted-Lowry models, conjugate acids and bases.
- Autoionization of water, the pH scale, strong and weak acids, strong and weak bases, K_a and K_b.
- pH calculations for strong acid and base solution, weak acid and base solutions.
- Acid/base properties of salts.
- Lewis acids and bases, common ion effect, buffers, Henderson-Hasselbalch equation.
- ***BLB Chapters 16 (sections 16.1 - 16.9) and Chapter 17 (section 17.1 - 17.2)***

8. June 18: Review & Examination Information

Note: Due to time constraints, we may not be able to cover all the topics listed above.

Problem Sets

	End-of-Chapter Exercises from the textbook, "Chemistry, The Central Science" 9th edition by Brown, LeMay & Bursten.
Chapter 25: Organic Chemistry **Chapter 12: Modern Materials**	25.7, 25.11, 25.13, 25.15, 25.17, 25.19, 25.21, 25.23, 25.27, 25.28, 25.35, 25.36, 25.37, 25.38, 25.39, 25.40, 25.41, 25.42, 25.43, 25.44, 25.45, 25.46, 25.47, 25.48, 25.49, 25.51, 25.57, 25.59, 25.69, 25.72, 25.75, 25.76, 25.78, 25.80, 25.83 12.14, 12.15, 12.17, 12.20
Chapter 14: Chemical Kinetics	14.1, 14.5, 14.7, 14.9, 14.11, 14.13, 14.15, 14.17, 14.19, 14.21, 14.23, 14.25, 14.27, 14.29, 14.31, 14.33, 14.35, 14.37, 14.39, 14.43, 14.45, 14.49, 14.53, 14.55, 14.57, 14.61, 14.63, 14.65, 14.75, 14.78, 14.80, 14.84
Chapter 15: Chemical Equilibrium	15.1, 15.3, 15.5, 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, 15.41, 15.43, 15.45, 15.57, 15.66
Chapter 5: Thermochemistry	5.11, 5.13, 5.17, 5.19, 5.20, 5.21, 5.25, 5.27, 5.29, 5.33, 5.37, 5.39, 5.41, 5.45, 5.49, 5.50, 5.51, 5.57, 5.59, 5.61, 5.63, 5.67, 5.71, 5.75, 5.85, 5.100, 5.111
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, 19.73, 19.77, 19.81, 19.83
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: Aqueous Equilibria	17.1, 17.3, 17.5, 17.9, 17.13, 17.15, 17.17, 17.19, 17.21, 17.23, 17.25, 17.29, 17.31

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APPROVED COURSE DESCRIPTION

Education Council Approved June 2003
date

1. Course Abbreviation, Number & Title

(Title is limited to 30 characters including spaces.)

CHEM 121 College Chemistry 2

2. Calendar Description

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

This course is a continuation of CHEM 120 and covers the following topics: chemical kinetics, equilibrium, acids and bases, thermodynamics, electrochemistry, colligative properties and provides an introduction to organic chemistry. The laboratory experiments provide practical experience in nearly all the areas covered in the lectures.

3. Pre-requisites

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

CHEM 120

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]; lab [3]; seminar [0]; practicum [0]

estimated out-of-class [6]

number of weeks [14]

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

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 the specialized vocabulary and nomenclature based on the IUPAC system of organic compounds to name and draw structures for many simple organic compounds containing the common functional groups.
2. Write chemical reactions to illustrate numerous transformations between organic functional groups.
3. Draw structural and stereoisomers of organic compounds and name stereoisomers based upon the IUPAC system of nomenclature.
4. Demonstrate an understanding of the factors that influence the rate of a chemical reaction, deduce the rate of a chemical reaction from time/concentration data, and utilize rate laws to perform kinetic calculations.
5. Apply the laws of thermodynamics and account for the factors that lead to spontaneous physical and chemical changes.
6. Explain how and why reactions attain equilibrium positions and perform calculations pertaining to equilibrium systems.
7. Describe redox reactions, use electrochemical data to predict the spontaneity of redox reactions, and comprehend the structures of electrochemical cells.
8. Describe various acid-base theories and apply these theories to acid-base reactions in aqueous solution.
9. Perform experiments in the areas of preparative organic, preparative inorganic, physical and analytical chemistry and use the various associated pieces of laboratory equipment.

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