

	<p><b>SCHOOL OF ARTS &amp; SCIENCE</b>  <b>CHEMISTRY AND GEOSCIENCE DEPARTMENT</b></p> <p><b>CHEM 121-003</b></p> <p><b>2014 Winter</b></p>
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## A. Contact Information

Instructor: Hugh Cartwright

Office: Fisher tba, Phone: local tba

E-mail: [CartwrightH@camosun.bc.ca](mailto:CartwrightH@camosun.bc.ca)

Email is a better method of communication than phone and should always be used for non-urgent matters. Minor queries can often be dealt with before or after class, or via email. For more substantial problems, arrange a time to see me in person.

**Lectures:** Thursday 6.30 pm – 9.20 pm (F 310)

**Labs:** Tuesday 6.30 pm – 9.20 pm (normally in F356/358, but the initial January 7<sup>th</sup> meeting will be a lecture class in F 310)

**Office Hours:** Regular office hours as discussed in the first class; other times by appointment.

**Important Dates:** see <http://camosun.ca/learn/calendar/current/pdf/important-dates.pdf>

January 7 <sup>th</sup>	1 <sup>st</sup> day of Chem 121	January 20 <sup>th</sup>	Fee deadline
February 10 <sup>th</sup>	Family Day (College closed)	February 13 <sup>th</sup> - 14 <sup>th</sup>	Reading Break
April 18 <sup>th</sup>	Good Friday	April 21 <sup>st</sup>	Easter Monday
	April 14 <sup>th</sup> – 17 <sup>th</sup> , 22 <sup>nd</sup> – 25 <sup>th</sup>	Exam period	

## B. Required Materials

**Text:** *Chemistry, The Central Science: a Broad Perspective*, by Brown, Lemay, Bursten, Langford, Sagatys, and Duffy. Prentice Hall. Australian edition, 2<sup>nd</sup> edition (blue); the 1<sup>st</sup> edition (purple/green) is an acceptable alternative, as are the 10<sup>th</sup> and 11<sup>th</sup> US editions.

**Lab Manual:** Chemistry 121 Laboratory Manual, (from the bookstore).

## C. Exams and Problem Sets

There will be two 2 hour written midterm tests (dates and content to be advised) and a 3 hour written final examination which will cover material in the whole course.

There are questions at the end of each chapter in the text; it will help your understanding if you try to answer these. Solutions to the red-numbered problems are given at the end of the text and on the accompanying CD. Answers to the black problems will be given on request. There will also be in-class questions that relate to the lecture material. Take note of any difficulties that you have with these problems so that you can review the relevant topics, and if necessary ask for help.

#### D. Summary of Lecture Content

The table gives a broad outline of the topics to be covered; minor adjustments to content and timing may be made as the course progresses.

Area	Main Topics	Classes (approx)	Textbook chapters*
<b>Organic Chemistry</b>	Hydrocarbons: alkanes, alkenes, alkynes, Structural isomerism, Naming of organic compounds, Reactions of alkanes: combustion, substitution, Reaction mechanism, Free radical reactions, Cyclic hydrocarbons, Addition to alkenes, Stereoisomerism, Simple functional groups: alcohols, ethers, carboxylic acids, aldehydes, halogen compounds, Optical isomerism, Synthesis and typical reactions of alcohols and acids, Aromatic compounds: structure and naming, Reactions of aromatic compounds, Polymers	<b>3</b>	<b>21 to 27, selected topics.</b>
<b>Chemical Kinetics</b>	Reaction rate as measured by change in concentration, Factors that influence reaction rate, Collision theory, Rate law: meaning, types, examples, Half-life, Determining a rate law from experimental data, Activation energy, Activated complex theory, Why temperature affects rate, Arrhenius equation, Catalysts, enzymes, Reaction mechanism and the link to rate laws; rate-determining step	<b>2</b>	<b>12</b>
<b>Thermo-chemistry</b>	Energy, 1 <sup>st</sup> law, Enthalpy; enthalpy of combustion, fuels, Calorimetry, Enthalpy of reaction, Hess's Law, Calculations	<b>1</b>	<b>4</b>
<b>Thermo-dynamics</b>	Spontaneity; reversibility, Entropy and the direction of time, Gibbs Energy, 2 <sup>nd</sup> law, 3 <sup>rd</sup> law; 3 <sup>rd</sup> law entropy, Free energy and temperature, Non-spontaneous processes, Calculations	<b>1</b>	<b>4</b>
<b>Equilibrium</b>	Homogeneous and heterogeneous equilibria, Reaction	<b>1 - 1.5</b>	<b>13</b>

	quotient, Condition of equilibrium, Equilibrium constants; Kc, Kp, Le Chatelier, Link between equilibrium and free energy, Calculating K from experimental data; Haber process, Calculating K from Free Energy changes, Hess's law revisited		
<b>Acids and Bases</b>	Definitions of acids and bases: Arrhenius, Lewis, Bronsted-Lowery, Weak and strong acids and bases, Conjugate acids/bases, pH; calculations for weak and strong acids, Ka and Kb, Relationship between strength and structure, Auto-ionization of water, Titration	<b>1.5 - 2</b>	<b>14</b>
<b>Aqueous equilibria</b>	Solubility of ionic compounds, Acid/base nature of salts, Common ion effect, Complex ions, Buffers	<b>1</b>	<b>15</b>
<b>Electrochemistry</b>	Redox reactions, Electrochemical cells, batteries, Half cells, Balancing redox reactions, Standard electrode potential, Nernst equation, Connection between Free Energy and cell voltage	<b>1</b>	<b>3, 16</b>

**\*textbook chapters are from Brown, LeMay, Bursten; 2<sup>nd</sup> Australian edition**

### **E. Assessment**

The course mark will be calculated as follows:

2 Midterm tests	(12.5 % each) = 25 %
Final exam	45 %
Laboratory work	30 %

If you miss a midterm due to illness or unavoidable commitments, the weight of the missed test will be carried over to the final. There are no make-up dates for the midterm tests or the final exam.

### **F. Laboratory Mark**

Your work in the laboratory will be assessed as follows:

<b>Arriving punctually, fully prepared for the experiment, familiar with the procedure and having the correct safety gear.</b>	10 %
<b>Ability to work competently and confidently with good attitude.</b>	15 %
<b>Pre-lab assignments (completed before the class)</b>	10 %

<b>Quality of Report</b>	60 %
<b>Leaving your workspace clean and tidy</b>	5 %

No more than two laboratory classes may be missed during the course unless there are extenuating circumstances; if you miss more than two lab classes without an acceptable excuse you will fail the course. If you miss a lab without good reason you will be given a mark of zero for this experiment. If you are unable to attend a lab class, attempt to obtain data from a partner or perform the class with another section so that you can submit a report.

You must hand in your pre-lab assignment as you enter the lab. If you fail to do this you will receive a mark of zero for the pre-lab and you will not be permitted to start the experiment until the pre-lab has been satisfactorily completed.

Reports are due in 1 week after you performed the experiment. If your report is late by up to 1 week, you will lose 25% of the report marks. Reports that are more than one week late without adequate excuse will be given a mark of zero. Reports will be marked and returned to you; please retain them.

Further information about the format of reports will be provided in the first class; bear this information in mind as you prepare your reports. A lab schedule will also be provided in this class.

**You must pass both the Laboratory section and the lecture section of the course with a mark of at least 50 % in each part.**

**You must obtain, and use, safety glasses; you are advised to wear a lab coat while doing experimental work. It is not the responsibility of the College to provide safety glasses or lab coats.**

## G. Grading

The following scale is used by Camosun College:

>90 A+ 77-79 B+ 65-69 C+ 50-59 D 0-49 F

85-89 A 73-76 B 60-64 C

80-84 A- 70-72 B-

## H. Intended Learning Outcomes

*(No changes are to be made to this section, unless the Approved Course Description has been forwarded through EDCO for approval.)*

Upon completion of this 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.

## I. LEARNING SUPPORT AND SERVICES FOR STUDENTS

**There are a variety of services available for students to assist them throughout their learning. This information is available in the College Calendar, Registrar=s Office or the College web site at <http://www.camosun.bc.ca>**

## ACADEMIC CONDUCT POLICY

There is an Academic Conduct Policy. It is the student's responsibility to become familiar with the content of this policy. The policy is available in each School Administration Office, Registration, and on the College web site in the Policy Section.

[www.camosun.bc.ca/divisions/pres/policy/2-education/2-8](http://www.camosun.bc.ca/divisions/pres/policy/2-education/2-8)