CAMOSUN COLLEGE	***School of Arts & Science*** ***CHEMISTRY AND GEOSCIENCE DEPARTMENT*** **CHEM 230-001** **Organic Chemistry 1** **2010W**

COURSE OUTLINE (Credit: 4)

This course provides a general introduction to the theory and practice of organic chemistry. Topics include alkanes, stereochemistry, alkyl halides, substitution and elimination reactions, free radical reactions, alcohols, ethers, spectroscopy, alkenes, and alkynes. The laboratory experiments are designed to expose students to a wide range of organic laboratory techniques.

1. Instructor Information

(a)	Instructor:	Larry Lee		
(b)	Office Hours:	Mon 10:30-11:30 & 17:30 – 18:30; Wed 10:30-12:30 Thurs13:30 – 15:30 Friday 10:30-12:30		
(c)	Location:	Fisher 348D		
(d)	Phone:	370-3463	Alternative Phone:	
(e)	Email:	leel@camosun.bc.ca		
(f)	Website:	www.leel.disted.camosun.bc.ca		

2. Intended Learning Outcomes

Upon completion of this course the student will be able to:

1. Utilize the specialized vocabulary and nomeclature based on the IUPAC system for organic compounds including alkanes, cycloalkanes, alkenes, alkynes, alcohols, ethers, epoxides, and alkyl halides according to their structures and functional groups present.
2. Describe the general physical properties such as stability, acidity and basicity, density, melting and boiling point, and water solubility of the above compounds.
3. Describe the chemical properties of the above classes of organic compounds, and explain any differences and similarities.
4. Draw a synthetic scheme outlining the preparation of some of the compounds above and their subsequent reactions, including details such as stereochemistry of some typical reactions and mechanisms, stability of transition states, intermediates, products, and factors affecting the outcome.
5. Utilize the concepts of functional group transformations and reaction mechanisms to explain organic reactions.
6. Demonstrate an ability to apply the method of retrosynthetic analysis based on the knowledge of some general organic reactions of the above compounds.
7. Identify the fundamental differences among the three types of isomerism: structural, geometric, and stereo.
8. Recognize and draw Newman, Fischer, and Haworth projections.
9. Communicate an understanding of the Cahn-Prelog-Ingold sequence rules and to recognize basic differences between enantiomeric and diastereomeric compounds.

10. Communicate an understanding of the phenomena of infrared, ultra violet-visible, and mass spectroscopy and to interpret and predict the spectroscopic data for the classes of organic compounds listed above.

3. Required Materials

(a)	Texts	Organic chemistry, 7th edition by John McMurry
(b)	Lab	Lab Manual Chem 230, Camosun College, 2007, by Nasr Khalifa
(c)	Other	A molecular model set is highly recommended. Lab coat is required

4. Course Content and Schedule

Hours of Delivery: 3 hour of lectures and 3 hours of labs. Duration: 15 weeks.
Lectures are Monday, Wednesday, Friday (9:30 -10:20 am).
Labs are available Monday (6:30 -9:30 pm) or Thursday (9 am -12:00 pm).

You must go to your registered lab section. Only a medical note will grant you permission to work in a non registered lab. Estimated out-of-class: at least 6 hours.

Detailed Course Outline:

1. Review and Preview: Chemical Bonding (Chapters 1, 2); Acid and Base Theory As It Relates To Organic Chemistry (Chapter 2); Alkanes and Cycloalkanes (Chapter 3); An overview of Organic Reactions (Chapter 5)
*** lectures are scheduled to cover topics that were not covered in Chem121, a review problem set will be given)**

-Structural theory of organic chemistry, Lewis structures, Exceptions to the octet rule, formal charges, Atomic orbitals, molecular orbitals, Resonance, hybridization, Molecular geometry, polar and nonpolar molecules, Carbon-carbon covalent bonds, Aromaticity, Functional groups; classification of organic compounds into families, Organic reactions and mechanisms.
-Acid and base reactions, Homolysis and heterolysis of bonds to carbon, Use of curved arrows in reaction mechanisms, Carbocations and carboanions, The strength of acids and bases, K_a and pK_a
-Relationship between structure and acidity, Effect of the solvent on acidity, protic and aprotic solvents, Acids and bases in nonaqueous solutions
-IUPAC nomenclature, Physical properties of alkanes and cycloalkanes, Bicyclic and polycyclic alkanes, Synthesis of alkanes and cycloalkanes, Reactions of alkanes

2. Stereochemistry and Chirality: (Chapter 4 (omit 4.6), 6.6, 9.1 – 9.11, 9.15)
-Conformational analysis of ethane, propane, and butane
-Ring strain in cycloalkanes
-Conformations of cyclohexanes
-Isomerism: constitutional isomers and stereoisomers
-Enantiomers and chiral molecules
-Nomenclature of enantiomers, the R-S system
-Optical activity
-Diastereomers, Fischer projection formulas
-The E,Z designation in alkenes
-Separation of enantiomers; resolution
-Compounds with stereocenters other than carbon

3. **Free Radical Reactions: (Chapter 10.2 – 10.6)**
-Reactions of alkanes with halogens
-Chlorination of methane, mechanism
-Halogenation of higher alkanes,
-Geometry of alkyl radicals, stereochemistry of the reactions
-Selectivity in radical substitution reactions
-Radical polymerization

4. Nucleophilic Substitution and Elimination Reactions: (Ch 10.1 – 10.2, 11, omit 11.13)
-Organic halides, physical properties
-Nucleophilic sustitution reactions, nucleophiles, leaving groups
-Themodynamic and kinetic control of reactions
-Transition state theory, energy diagrams
-Mechanism for S_N1 and S_N2 reactions, stereochemistry
-Factors affecting the rates of S_N1 and S_N2 reactions, solvent effects
-Elimination reactions of alkyl halides, the E2 and the E1 reactions
-Substitution versus elimination
-Functional group transformations using the S_N2 reaction

5. Spectroscopy: (Chapters 12, 14.8 – 14.11)
-The electromagnetic spectrum
-Absorption spectra, transitions between electronic energy levels
-Ultraviolet spectroscopy, relationship between structure and λ_{max}
-Infrared spectroscopy, molecular vibrations and absorption frequencies,
-IR spectra of alcohols, aldehydes, ketones, carboxylic acids, esters, aromatic compounds
-Mass spectroscopy, molecular ions, fragmentation patterns, isotopes
-Use of UV/VIS, IR, and MS spectra to elucidate structures of organic compounds

6. Alkenes and Alkynes: (Chapters 6, omit 6.11, 9.12-9.14, 7, omit 7.6, 8)
-Structure and nomenclature
-Physical properties: stability, boiling point, solubility
-Preparation of alkenes and alkynes
-Polar additions to the carbon-carbon multiple bond: ionic addition, carbocations, addition of halogens,
  -Markovnikov's Rule , Anti-Markovnikov addition of HBr
  -hydration using mercuric acetate, hydroboration, addition of carbenes
-Catalytic hydrogenation: the catalyst, stereochemistry
-Oxidation of alkenes: conversion to diols, cleavage of the double bond
-Alkynes as acids, hydration of alkynes, reduction of alkynes
-The Diels-Alder reaction, stereochemistry **(Chapter 14.5-14.6)**
-Synthetic methodology and applications

7. Alcohols: (Chapter 17, omit 17.9-17.12)
-Classification and nomenclature
-Physical properties: boiling points, solubility in water
-Preparation of alcohols: hydration of alkenes, oxymercuration and demercuration, hydroboration of alkenes, nucleophilic substitution reactions
-Acidity and basicity of alcohols
-Reactions of alkoxide ions
-Mesylates and tosylates
-Concept of protecting groups, use in synthesis
-Substitution reactions of alcohols: reactivity of alcohols toward hydrogen halides, S_N1 vs S_N2
-Other reagents to convert alcohols to alkyl halides
-Elimination reactions of alcohols
-Oxidation reactions of alcohols, chromium (VI) reagents, potassium permanganate, selective oxidation.

8. Ethers and Epoxides: (Chapter 18.1 – 18.9, omit 18.4, 18.6)
-Nomenclature of ethers and epoxides
-Physical properties of ethers and crown ethers
-Preparation of ethers: preparation of diethyl ether, Williamson ether synthesis, acid-catalysed Markovnikov addition to alkenes, cyclic ethers
-Preparation of epoxides
-Substitution reactions of ethers
-Substitution reactions of epoxides: mechanism of base-catalysed and acid-catalysed cleavage, anti-hydroxylation of alkenes via epoxides
-Synthetic applications

5. Basis of Student Assessment (Weighting)

(a)	Assignments	Not graded	Exam schedule
(b)	Quiz Take home	10 %	
(c)	Exams (4)	Test 1 - 7.5% Test 2 - 15% Test 3 - 7.5% Final Exam – 35%	January 29, 2010 (class) March 1, 2010 (in lab – 2h) March 4, 2010 (in lab – 2h) March 29, 2010 (in class) April 12 - April 20
(d)	Lab experimental	25%	

Term tests are compulsory and the mark for any single term test or combination of term tests is **not** replaced by the final exam mark except as described below.

A zero is give as the mark for any quiz or final exam not written and for which no official medical excuse is provided. The medical excuse must be dated within the week of the exam and must be handed in within two weeks of the exam date. **The medical excuse must provide sufficient information to establish that the student was not able to write the exam due to his/her medical condition. Students will also be required to give written consent for information about their medical condition to be disclosed to the instructor**. Any such information obtained is treated as confidential.

At least 75% of the lab must be completed and a passing grade obtained in order to write the final exam.

You must pass both lecture and lab portion in order to pass the course.
The final exam at the end of the course will cover all course material.

You must provide your own **safety glasses**. Prescription glasses are OK, but sunglasses are **NOT**. You must wear safety glasses at all times while you are in the lab. You will not be allowed to carry out any experiments without safety glasses.

Some lab classes will be used for lectures and tutorials (please note dates)

6. Grading System Standard Grading System (GPA)

Percentage	Grade	Description	Grade Point Equivalency
90-100	A+		9
85-90	A		8
80-84	A-		7
77-79	B+		6
73-76	B		5
70-72	B-		4
65-69	C+		3
60-64	C		2
50-59	D		1
0-49	F	Minimum level has not been achieved.	0

Temporary Grades

Temporary grades are assigned for specific circumstances and will convert to a final grade according to the grading scheme being used in the course. See Grading Policy at **camosun.ca** or information on conversion to final grades, and for additional information on student record and transcript notations.

Temporary Grade	Description
I	*Incomplete*: A temporary grade assigned when the requirements of a course have not yet been completed due to hardship or extenuating circumstances, such as illness or death in the family.
IP	*In progress*: A temporary grade assigned for courses that are designed to have an anticipated enrollment that extends beyond one term. No more than two IP grades will be assigned for the same course.
CW	*Compulsory Withdrawal:* A temporary grade assigned by a Dean when an instructor, after documenting the prescriptive strategies applied and consulting with peers, deems that a student is unsafe to self or others and must be removed from the lab, practicum, worksite, or field placement.

Temporary grades are assigned for specific circumstances and will convert to a final grade according to the grading scheme being used in the course. See Grading Policy E-1.5 at **camosun.ca** for information on conversion to final grades, and for additional information on student record and transcript notations.

7. Recommended Materials or Services to Assist Students to Succeed Throughout the Course

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, at Student Services or the College web site at camosun.ca.

STUDENT CONDUCT POLICY

There is a Student Conduct Policy **which includes plagiarism**.
It is the student's responsibility to become familiar with the content of this policy. The policy is available in each School Administration Office, at Student Services and on the College web site in the Policy Section.

ADDITIONAL COMMENTS AS APPROPRIATE OR AS REQUIRED