CAMOSUN COLLEGE
School of Arts & Science
Department of Chemistry & Geoscience

CHEM-231-001
College Chemistry 1
Summer 2018

COURSE OUTLINE

The course description is online @ http://camosun.ca/learn/calendar/current/web/chem.html

Ω *Please note: This outline will not be kept indefinitely. It is recommended students keep this outline for their records, especially to assist in transfer credit to post-secondary institutions.*

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1. Instructor Information

(a) Instructor	Dr. Steve McKinnon		
(b) Office hours	See Schedule or by appointment		
(c) Location	Fisher 348A		
(d) Phone	250-370-3472	**Alternative:**	
(e) E-mail	mckinnons@camosun.bc.ca		
(f) Website	D2L		

2. Intended Learning Outcomes

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

1. Utilize the specialized vocabulary and nomenclature based on the IUPAC system for organic compounds including aldehydes, ketones, benzene & its derivatives, carboxylic acids and their derivatives, amines, and carbohydrates according to their structures and functional groups present.
2. Compare and contrast the general physical properties such as stability, acidity and basicity, melting and boiling point, and water solubility.
3. Describe the chemical properties of the above classes of organic compounds, and relate any differences and similarities.
4. Draw a synthetic route outlining the preparation of some of the compounds above and their reactions, including details such as stereochemistry of selected 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 use the method of retrosynthetic analysis to interconvert the above classes of organic compounds.
7. Communicate an understanding of the phenomena of proton and carbon-13 nuclear magnetic resonance spectroscopy and to interpret and predict the spectroscopic data for the classes of organic compounds listed above.

3. Required Materials

(a) Text

"Organic Chemistry", 7th Edition, by Paula Bruice
Solution manual is recommended

Lab Experiments: "Organic Chemistry Experiments for Chemistry 230 and 231" by Rin Raap and Nasr Khalifa

(b) Other

Safety Glasses and Lab Coat

4. Course Content and Schedule

Detailed Course Outline:

1. Review: Alcohols, Ethers and Epoxides: (Chapter 11, Chapter 18.1-18.9)

-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 **(Chapter 10)**, acidity and basicity of alcohols, reactions of alkoxide ions, mesylates and tosylates, protecting groups and use in synthesis, substitution reactions of alcohols: reactivity of alcohols toward hydrogen halides, SN1 vs SN2, other reagents to convert alcohols to alkyl halides, elimination reactions of alcohols, oxidation reactions of alcohols, chromium (VI) reagents, potassium permanganate, selective oxidation
-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

2. Aldehydes and Ketones: (Chapter 17)

-Nomenclature, physical properties
-Preparation of aldehydes and ketones
-Nucleophilic addition reactions, reversible and irreversible addition reactions; hydrates, hemiacetals, acetals, thioacetals
-Reduction of carbonyl compounds: sodium borohydride, lithium aluminum hydride, catalytic hydrogenation
-Chemical tests for primary and secondary alcohols
-Reactions with ammonia and amines, imines, the Wolff-Kishner reaction
-Raney Nickel reduction, Clemmensen reduction
-Wittig reaction
-Oxidation: using Mn and Cr oxidizing reagents
-Baeyer-Villiger oxidation
-Organometallic compounds; Grignard reagents, alkyllithium reagents, sodium alkynides
-Synthetic methodolgy and applications

3. The Chemistry of Benzene and Its Derivatives: (Chapters 19, 20)

-Nomenclature
-Aromaticity, stability of benzene, Huckel's rule
-Aromatic ions
-Resonance and inductive effects of substituents: acidity of phenols, basicity of anilines
-Electrophilic aromatic substitution: electrophiles, first substitution, nitration, halogenation, sulfonation, mechanism of electrophilic aromatic substitution reactions
-Friedel-Crafts alkylation and acylation
-Second substitution, reactivity, orientation
-Third substitution, reinforcement and opposition
-Nucleophilic aromatic substitution reactions, diazonium salts
-Synthetic applications

4. Spectroscopy: (Chapter 14, 15)

-Electromagnetic spectrum
-Nuclear magnetic resonance spectroscopy, 1H NMR, 13C NMR
-Structure elucidation using IR, UV/VIS, MS, and NMR spectra of alkylhalides, alcohols, alkenes, alkynes, carbonyl compounds, carboxylic acids, aromatic compounds, amines, nitriles

5. Carboxylic Acids and Their Derivatives: (Chapters 16)

-Nomenclature of carboxylic acids
-Physical properties
-Effect of structure on the acidity
-Preparation of carboxylic acids: oxidation of primary alcohols and aldehydes, oxidation of alkenes, oxidation of alkylbenzenes, hydrolysis of nitriles and cyanohydrins, Grignard method
-Reactions of carboxylic acids: reduction, reaction with bases, esterification
-Polyfunctional carboxylic acids: diprotic acids, anhydrides from diprotic acids, β-keto acids, β-diacids
-Derivatives of carboxylic acids: types, reactivity
-Acid halides: nomenclature, preparation, hydrolysis, reactions with nucleophiles
-Anhydrides: nomenclature, preparation, hydrolysis, reactions with nucleophiles,
-Esters: nomenclature, preparation, acid-catalysed and base-catalysed hydrolysis, trans-esterification, reduction, reactions with nucleophiles, as protecting groups
-Polyesters, hydroxycarboxylic acids
-Lactones: preparation, biological examples
-Amides: nomenclature, preparation, acidity and basicity, representative reactions; hydrolysis, reduction, dehydration, the peptide bond
-Nitriles: nomenclature, preparation, representative reactions; hydrolysis, reduction

6. The Chemistry of Enolate Ions: (Chapters 18)
-Acidity of α-hydrogens of carbonyl compounds
-Keto-enol tautomerization
-Reactions via enols and enolate ions: racemization, halogenation, haloform reaction, Hell-Volhard-Zelinski reaction.
-Aldol condensation: dehydration of product, synthetic applications, crossed aldol condensation, intramolecular aldol condensation, Robinson annelation.
-Ester condensation: Claisen condensation, crossed Claisen condensation, Dieckmann condensation
-Additions to α,β-unsaturated carbonyl compounds: 1,4- vs 1,2-additions, addition of organocopper reagents, Michael addition
-Direct alkylation of active hydrogen compounds
-Synthetic applications

7. The Chemistry of Amines: (Chapter 11, 19)
-Nomenclature, physical properties, preparation, basicity, biologically active amines
-Nitrosation reactions, Sandmeyer reaction
-Azo compounds; synthesis, as dyes

8. Carbohydrates: (Chapter 21)
-Structure; ketoses, aldoses, pyranoses, furanoses
-Fischer projections, D- and L- designation
-Mutarotation of glucose
-Glycosides, the anomeric effect
-Reactions of monosaccarides as alcohols
-The Kiliani-Fischer synthesis
-Disaccharides and polysaccharides

5. Basis of Student Assessment (Weighting)

a)	Laboratory		25%	25%
b)	Tests	Midterm 1 Midterm 2 Midterm 3 Midterm 4 Final Exam	10% 10% 10% 10% 35%	7.5% 7.5% 7.5% 7.5% 35%
c)	Assignments	Mastering - Optional		10%

Notes
1. Students must complete a minimum of 70% of the laboratory work to pass the laboratory component of Chem 231. Students must pass the laboratory portion (>50%) of the course in order to obtain credit for Chem 231.

2. Students must pass the Lecture and Lab portion of the course to pass the course.
3. Students must write each test as scheduled. No one is allowed to write late and there will be no exceptions. Early exam is a privilege and not a right, at full discretion of the instructor.
See Camosun website for information on fee and drop deadlines.
http://camosun.ca/learn/fees/#deadlines

6. Grading System

[X] Standard Grading System (GPA)

[ ] Competency Based Grading System

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

8. College Supports, Services and Policies

Immediate, Urgent, or Emergency Support
If you or someone you know requires immediate, urgent, or emergency support (e.g. illness, injury, thoughts of suicide, sexual assault, etc.), **SEEK HELP**. Resource contacts @ http://camosun.ca/about/mental-health/emergency.html or http://camosun.ca/services/sexual-violence/get-support.html#urgent

College Services
Camosun offers a variety of health and academic support services, including counselling, dental, disability resource centre, help centre, learning skills, sexual violence support & education, library, and writing centre. For more information on each of these services, visit the **STUDENT SERVICES** link on the College website at http://camosun.ca/

College Policies
Camosun strives to provide clear, transparent, and easily accessible policies that exemplify the college's commitment to life-changing learning. It is the student's responsibility to become familiar with the content of College policies. Policies are available on the College website at http://camosun.ca/about/policies/. Education and academic policies include, but are not limited to, Academic Progress, Admission, Course Withdrawals, Standards for Awarding Credentials, Involuntary Health and Safety Leave of Absence, Prior Learning Assessment, Medical/Compassionate Withdrawal, Sexual Violence and Misconduct, Student Ancillary Fees, Student Appeals, Student Conduct, and Student Penalties and Fines.

A. GRADING SYSTEMS *http://camosun.ca/about/policies/index.html*

The following two grading systems are used at Camosun College:

1. Standard Grading System (GPA)

Percentage	Grade	Description	Grade Point Equivalency
90-100	A+		9
85-89	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

2. Competency Based Grading System (Non GPA)

This grading system is based on satisfactory acquisition of defined skills or successful completion of the course learning outcomes

Grade	Description
COM	The student has met the goals, criteria, or competencies established for this course, practicum or field placement.
DST	The student has met and exceeded, above and beyond expectation, the goals, criteria, or competencies established for this course, practicum or field placement.
NC	The student has not met the goals, criteria or competencies established for this course, practicum or field placement.

B. 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 http://camosun.ca/about/policies/index.html for 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.