COURSE SYLLABUS

Camosun College campuses are located on the traditional territories of the Lək̓ʷəŋən and W̱SÁNEĆ peoples. We acknowledge their welcome and graciousness to the students who seek knowledge here.
Learn more about Camosun's Territorial Acknowledgement.

COURSE TITLE: CHEM 121 (College Chemistry 2)

CLASS SECTION: 002

TERM: Winter 2023

COURSE CREDITS: 3

DELIVERY METHOD(S): Lecture and laboratory

For COVID-19 updates please visit https://camosun.ca/about/covid-19-updates.

Camosun College requires mandatory attendance for the first class meeting of each course. If you do not attend, and do not provide your instructor with a reasonable explanation in advance, you will be removed from the course and the space offered to the next waitlisted student.

INSTRUCTOR DETAILS

NAME: Neil Meanwell

EMAIL: meanwen@camosun.bc.ca

OFFICE: F 348B

HOURS: Mon-Thurs, 1.30 - 2.30 pm; Thurs, 11.30 am – 12.30 pm.

As your course instructor, I endeavour to provide an inclusive learning environment. However, if you experience barriers to learning in this course, do not hesitate to discuss them with me. Camosun College is committed to identifying and removing institutional and social barriers that prevent access and impede success.

CALENDAR DESCRIPTION

This course is a continuation of CHEM 120 and covers the following: chemical kinetics, acids and bases, thermodynamics, electrochemistry and provides an introduction to organic chemistry. The laboratory experiments provide practical experience in each area covered in lectures. (T)

PREREQUISITE(S): C in CHEM 120 - Must be completed prior to taking this course.
CO-REQUISITE(S): None
EQUIVALENCIES: None

COURSE LEARNING OUTCOMES / OBJECTIVES

Upon completion of this course a 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.

REQUIRED MATERIALS & RECOMMENDED PREPARATION / INFORMATION

(a) Principal Text: CHEMISTRY, The Central Science: a Broad Perspective Bursten, Murphy, Woodward, Langford, Sagatys and George, 3rd Edition (2014) or Camosun Custom Edition. Publisher: Pearson. Hard Copy or e-book. If you have previously purchased the e-book the code is valid for multiple courses for 2 years from purchase. So if you already have a code (from Chemistry 120) there is no need to get another.

(b) Chemistry 121 Laboratory Manual, 2020 Edition (In-house).
(c) Safety glasses and a laboratory coat.

COURSE SCHEDULE, TOPICS, AND ASSOCIATED PREPARATION / ACTIVITY / EVALUATION

(a) Scheduled lectures: Mon (F 302), Wed (F 336) and Thurs (F 336), 12.30 pm to 1.20 pm
The following schedule and course components are subject to change with reasonable advance notice, as deemed appropriate by the instructor.

WEEK	ACTIVITY or TOPIC	NOTES
1	**Organic Chemistry:** Hydrocarbons - Alkanes. Bonding and VB theory. Conformations and Newman projections. Constitutional isomers. Nomenclature. Cycloalkanes, ring strain, boat and chair conformations, axial and equatorial positions, 1,3-diaxial interactions.	Chapter 22
2	Structures of unsaturated hydrocarbons – alkenes and alkynes (VB theory). Isomerism, cis-trans and *E,Z* nomenclature. Alcohols, Haloalkanes and Ethers- structure, properties and nomenclature. Aldehydes and Ketones**:** nature of the carbonyl group, definitions of ketones and aldehydes, nomenclature.	Chapters 24, 25 and 26
3	Carboxylic Acids and their Derivatives - Carboxylic acids, general properties, nomenclature, acidity, carboxylate anion. Esters and esterification, examples of esters. Fats (triglycerides). Benzene and its structure, delocalized pi-bonding. Other aromatic compounds (toluene, aniline, phenol, etc). Phenols. Nomenclature. Amines and amides, general properties and nomenclature, amine and amide classification (primary, secondary and tertiary).	Chapters 27, 28 and 29
4	Stereochemistry of Organic Compounds - geometric isomers, enantiomers and diastereisomers (diastereomers). *Cis-trans* isomerism in cycloalkanes. Stereocentres. Chirality in organic compounds, enantiomers. Measuring optical activity, + and – rotations, dextrorotatory (*d*) and levorotatory (*l*), optically active, optically inactive, specific rotation. Meso compounds.	Chapter 23
5	**Reaction Kinetics**: Rates of chemical reactions, temperature and rate, differential and integrated rate laws.	Chapter 15
6	Reaction mechanisms, elementary reactions, molecularity, multistep mechanisms, rate laws for elementary reactions, rate determining step (RDS) approximation. Activated complex theory. Nucleophilic substitution reactions, nucleophiles, S_N2 mechanism, transition state, inversion of stereochemistry, leaving groups. S_N1 mechanism, carbocation intermediate.	Chapters 15 and 25
7	Reading week.	N/A

WEEK	ACTIVITY or TOPIC	NOTES
8	**Chemical Equilibrium**: The equilibrium constant, the equilibrium constant expression, evaluating K_c and Kp. Manipulating equilibrium constants, heterogeneous equilibria. Calculating equilibrium constants, ICE tables. Reaction quotient, Q.	Chapter 16
9	Le Chatelier's principle and its application to equilibrium problems, Haber process for synthesis of ammonia. **Thermodynamics**: Nature of energy, KE and PE, law of conservation of energy, transferring energy as work and heat. First law of thermodynamics, internal energy, U, changes in internal energy, endothermic and exothermic processes	Chapters 16 and 14
10	Enthalpy concept, features of quoted enthalpies, Hess's Law, enthalpies of formation, standard enthalpies, standard enthalpies of formation. Spontaneous processes, entropy concept and the second and third laws of thermodynamics, standard molar entropies. Gibbs (free) energy, standard Gibbs energies of formation, Gibbs energy and temperature, the equilibrium constant and the Gibbs energy.	Chapters 14 and 16
11	**Acid-Base Equilibria**: Acids and bases – brief review. Arfrhenius and Bronsted-Lowry acid-base theories, conjugate acid-base pairs. The autoionization of water, K_w. The pH and pOH scales Strong acids and bases, pH calculations, weak acids, weak bases K_a and K_b, calculating pH, percent ionization,	Chapter 17
12	Polyprotic acids, pH calculations. K_a/K_b relationship. Acid-base properties of salts. Acid-base behaviour and chemical structure, binary acids and oxyacids. Lewis acids and bases. The common-ion effect. Buffer solutions, buffer capacity and pH range, addition of strong acid or strong base.	Chapters 17 and 18
13	**Electrochemistry**: oxidation, reduction, oxidizing agent, reducing agent. Voltaic cells. Cell potentials under standard conditions, standard cell potentials, standard reduction potentials, standard hydrogen electrode, oxidizing agents and reducing agents.	Chapter 19
14	Gibbs energy and redox reactions, cell potential and Gibbs energy, the equilibrium constant. Cell potentials under non-standard conditions, the Nernst equation	Chapter 19

b) Laboratory: Tues, 2.30 pm to 5.20 pm (F 356)

Week # (Date)	**Activity/Experiment**	**Lab Report Due Date (by 9.00 pm)**
1. January 10th	Laboratory Orientation	
2. January 17th	Expt 1 Synthesis of Aspirin	January 24th
3. January 24th	Expt 2 Extraction of Caffeine	January 31st
4. January 31st	Expt 3 Synthesis of Banana Oil	February 7th
5. February 7th	Expt 4 Analysis of an Unknown Acid	February 19th
6. February 14th	Term Test 1	
7. February 21st	Reading Break	
8. February 28th	Expt 5 Reaction Rate of Bleach with Blue Dye	March 7th
9. March 7th	Expt 6 Thermochemistry	March 14th
10. March 14th	Expt 7 Equilibrium Constants	March 25th
11. March 21st	Term Test 2	
12. March 28th	Expt 8 pH Measurements and pK_a of Acetic Acid	April 4th
13. April 4th	Expt 9 Redox Reactions	April 11th
14. April 11th	Lecture/Review	

c) A laboratory report must be submitted for each of the experiments performed. Each report must be done individually and uploaded as a single PDF file into the designated folder on D2L by the time indicated on the laboratory schedule.

d) Worksheets for in-class problem solving.[1]

e) Online problem sets (MyLab and Mastering Chemistry).[2]

f) Two term tests (each 2 hours).[3]

g) A three-hour written final examination at the end of the course on all the material in the course.[4]

Notes

1. Worksheets are handed out at regular intervals during the semester. Most are worked through in class but, in any case, solutions are posted online. Most worksheets also have list of end-of-chapter questions which you are recommended to try. Solutions are also posted online. Note that you are **not asked to submit** solutions to worksheets for marking.

2. You will be required to periodically complete problem sets online using MyLab and Mastering Chemistry. **Note that you do receive credit for these problem sets**.

3. Tentatively scheduled for **weeks six** and **eleven** of the semester. These are written **during the lab period**.

4. The final will be set for the exam period following the end of classes. It will be a three hour written exam on all of the course material. The date and time will be posted on Camlink in February.

Students registered with the Centre for Accessible Learning (CAL) who complete quizzes, tests, and exams with academic accommodations have booking procedures and deadlines with CAL where advanced noticed is required. Deadlines can be reviewed on the CAL exams page. http://camosun.ca/services/accessible-learning/exams.html

EVALUATION OF LEARNING

DESCRIPTION	WEIGHTING
Online Assignments	15%
Term Test 1	15%
Term Test 2	15%
Final Examination	30%
Laboratory Work	25%
TOTAL	100%

Notes: a. In the event a student decides not to do the online assignments the weighting for the assignments will be transferred to the two terms tests (17.5% each) and the final (40%).
b) Any lecture mark percentage that is inferior to the Final Exam will be replaced by an equal weighting by the Final Exam.

If you have a concern about a grade you have received for an evaluation, please come and see me as soon as possible. Refer to the Grade Review and Appeals policy for more information. http://camosun.ca/about/policies/education-academic/e-1-programming-and-instruction/e-1.14.pdf
If you have a concern about a grade you have received for an evaluation, please come and see me as soon as possible. Refer to the Grade Review and Appeals policy for more information. http://camosun.ca/about/policies/education-academic/e-1-programming-and-instruction/e-1.14.pdf

COURSE GUIDELINES & EXPECTATIONS

Lecture Attendance To get the most out of this course, students are expected to attend all classes and be on time. It is your responsibility to acquire all information given during a class missed, including notes, hand-outs, changed exam dates etc.

Laboratory Attendance and Requirements

a) Students **must** attend the first laboratory meeting which is on safety in the laboratory and general laboratory procedure.

b) You must wear safety glasses and a laboratory coat at all times while an experiment is in progress. You will not be allowed to perform an experiment if you are not wearing the required safety equipment.

c) Each experiment has a **Prelab Exercise** which must be completed and uploaded onto D2L as a single PDF file by 2.30 pm on the day of the experiment.

d). If you **miss an experiment** you will be given a mark of **zero** for the experiment unless you have a valid medical reason or family emergency.

e). You **must pass both the lecture and laboratory** portions of the course separately in order to obtain a passing grade overall.

f). All lab reports must be submitted by the time indicated on the laboratory schedule. Each report must be loaded as a single document in PDF form. Late lab reports may be graded but marks equivalent to 10% of the total value of the assignment will be deducted for each day, inclusive of days on the weekend, past the deadline.

Exam Procedures All exams must be written at the scheduled times with the exception of students requiring an accommodation by CAL. It is understood that emergency circumstances do occur (e.g. severe illness or family emergency); for such circumstances accommodation may be offered at the discretion of the instructor, provided the student: a) notifies the instructor in advance of the exam (not after), and b) provides documented evidence of the circumstance (e.g. medical certificate). If an alternative test cannot be arranged the weighting from a missed test will be transferred to the final exam. If you have a concern about a grade you have received for an evaluation, please come and see me as soon as possible. Refer to the Grade Review and Appeals policy for more information. http://camosun.ca/about/policies/education-academic/e-1-programming-and-instruction/e-1.14.pdf CAMOSUN COLLEGE COURSE SYLLABUS If an exam is missed with an excused absence, it is up to the instructor's discretion as to how the mark will be made up. Be sure not to make travel plans for the end of semester until the final exam schedules are finalized and posted. Please ask any family members who might make travel plans on your behalf to consult you before booking tickets. Please note: the use of cell phones during a test or quiz is not allowed and may result in a zero for that assessment.

SCHOOL OR DEPARTMENTAL INFORMATION

The following is a link to the Science Help Centre:
https://camosun.ca/services/academic-support/help-centres/science-help-centres

The Science Help Centre hours will be posted on notice boards around the Department during the first week of classes.

Chemistry and Geoscience also has a study room (F 358) adjacent to the F 356 laboratory. The room is equipped with networked computers and a printer. It is a great place to study with fellow chemistry students.

STUDENT RESPONSIBILITY

Enrolment at Camosun assumes that the student will become a responsible member of the College community. As such, each student will display a positive work ethic, assist in the preservation of College property, and assume responsibility for their education by researching academic requirements and policies; demonstrating courtesy and respect toward others; and respecting expectations concerning attendance, assignments, deadlines, and appointments.

SUPPORTS AND SERVICES FOR STUDENTS

Camosun College offers a number of services to help you succeed in and out of the classroom. For a detailed overview of the supports and services visit http://camosun.ca/students/.

Support Service	Website
Academic Advising	http://camosun.ca/advising
Accessible Learning	http://camosun.ca/accessible-learning
Counselling	http://camosun.ca/counselling
Career Services	http://camosun.ca/coop
Financial Aid and Awards	http://camosun.ca/financialaid
Help Centres (Math/English/Science)	http://camosun.ca/help-centres
Indigenous Student Support	http://camosun.ca/indigenous
International Student Support	http://camosun.ca/international/
Learning Skills	http://camosun.ca/learningskills
Library	http://camosun.ca/services/library/
Office of Student Support	http://camosun.ca/oss
Ombudsperson	http://camosun.ca/ombuds
Registration	http://camosun.ca/registration
Technology Support	http://camosun.ca/its
Writing Centre	http://camosun.ca/writing-centre

If you have a mental health concern, please contact Counselling to arrange an appointment as soon as possible. Counselling sessions are available at both campuses during business hours. If you need urgent support after-hours, please contact the Vancouver Island Crisis Line at 1-888-494-3888 or call 911.

COLLEGE-WIDE POLICIES, PROCEDURES, REQUIREMENTS, AND STANDARDS

Academic Integrity

Students are expected to comply with all College policy regarding academic integrity; which is about honest and ethical behaviour in your education journey. The following guide is designed to help you understand your responsibilities: https://camosun.libguides.com/academicintegrity/welcome
Please visit http://camosun.ca/about/policies/education-academic/e-1-programming-and-instruction/e-1.13.pdf for Camosun's Academic Integrity policy and details for addressing and resolving matters of academic misconduct.

Academic Accommodations for Students with Disabilities

The College is committed to providing appropriate and reasonable academic accommodations to students with disabilities (i.e. physical, depression, learning, etc.). If you have a disability, the Centre for Accessible Learning (CAL) can help you document your needs, and where disability-related barriers to access in your courses exist, create an accommodation plan. By making a plan through CAL, you can ensure you have the appropriate academic accommodations you need without disclosing your diagnosis or condition to course instructors. Please visit the CAL website for contacts and to learn how to get started: http://camosun.ca/services/accessible-learning/

Academic Progress

Please visit https://www.camosun.ca/sites/default/files/2021-05/e-1.1_0.pdf for further details on how Camosun College monitors students' academic progress and what steps can be taken if a student is at risk of not meeting the College's academic progress standards.

Course Withdrawals Policy

Please visit http://camosun.ca/about/policies/education-academic/e-2-student-services-and-support/e-2.2.pdf for further details about course withdrawals. For deadline for fees, course drop dates, and tuition refund, please visit http://camosun.ca/learn/fees/#deadlines.

Grading Policy

Please visit http://camosun.ca/about/policies/education-academic/e-1-programming-and-instruction/e-1.5.pdf for further details about grading.

Grade Review and Appeals

Please visit http://camosun.ca/about/policies/education-academic/e-1-programming-and-instruction/e-1.14.pdf for policy relating to requests for review and appeal of grades.

Mandatory Attendance for First Class Meeting of Each Course

Camosun College requires mandatory attendance for the first class meeting of each course. If you do not attend, and do not provide your instructor with a reasonable reason in advance, you will be removed from the course and the space offered to the next waitlisted student. For more information, please see the "Attendance" section under "Registration Policies and Procedures" (https://camosun.ca/registration-

records/policies-and-procedures-students/registration-policies-students) and the Grading Policy at http://camosun.ca/about/policies/education-academic/e-1-programming-and-instruction/e-1.5.pdf.

Medical / Compassionate Withdrawals

Students who are incapacitated and unable to complete or succeed in their studies by virtue of serious and demonstrated exceptional circumstances may be eligible for a medical/compassionate withdrawal. Please visit http://camosun.ca/about/policies/education-academic/e-2-student-services-and-support/e-2.8.pdf to learn more about the process involved in a medical/compassionate withdrawal.

Sexual Violence and Misconduct

Camosun is committed to creating a campus culture of safety, respect, and consent. Camosun's Office of Student Support is responsible for offering support to students impacted by sexual violence. Regardless of when or where the sexual violence or misconduct occurred, students can access support at Camosun. The Office of Student Support will make sure students have a safe and private place to talk and will help them understand what supports are available and their options for next steps. The Office of Student Support respects a student's right to choose what is right for them. For more information see Camosun's Sexualized Violence and Misconduct Policy: http://www.camosun.ca/sites/default/files/2021-05/e-2.9.pdf and camosun.ca/sexual-violence. To contact the Office of Student Support: oss@camosun.ca or by phone: 250-370-3046 or 250-370-3841

Student Misconduct (Non-Academic)

Camosun College is committed to building the academic competency of all students, seeks to empower students to become agents of their own learning, and promotes academic belonging for everyone. Camosun also expects that all students to conduct themselves in a manner that contributes to a positive, supportive, and safe learning environment. Please review Camosun College's Student Misconduct Policy at http://camosun.ca/about/policies/education-academic/e-2-student-services-and-support/e-2.5.pdf to understand the College's expectations of academic integrity and student behavioural conduct.

Looking for other policies?

The full suite of College policies and directives can be found here: https://camosun.ca/about/camosun-college-policies-and-directives

Changes to this Syllabus: Every effort has been made to ensure that information in this syllabus is accurate at the time of publication. The College reserves the right to change courses if it becomes necessary so that course content remains relevant. In such cases, the instructor will give the students clear and timely notice of the changes.