

Chemistry 1154 R25
COURSE PRESENTATION
Fall 2023

We at Kwantlen Polytechnic University respectfully acknowledge that we live, work and study in a region that overlaps with the unceded traditional and ancestral First Nations territories of the Musqueam, Katzie, Semiahmoo, Tsawwassen, Qayqayt, and Kwikwetlem; and with the lands of the Kwantlen First Nation, which gifted its name to this university.

In the cause of reconciliation, we recognize our commitment to address and reduce ongoing systemic colonialism, oppression and racism that Indigenous Peoples continue to experience..

Important - This course will have in-person face-to-face sessions

Course: Chemistry 1154 R25
Classroom: Richmond Main, room 2630
Lab Room #: Richmond Main, room 3320
Phone/VM: (604) 599-2550

Instructor: Patrick Duffy
Class Hours: 8 - 10 Tuesdays and Fridays
Office Room #: Richmond Main, room 3345
Office Hours: Wednesdays and Thursdays 2 – 3, Fridays 1 – 2. Virtual office hours are available on request.

Email: patrick.duffy@kpu.ca

Web: <http://wordpress.kpu.ca/chem>

COURSE FORMAT

IMPORTANT: This course has in-person face-to-face sessions. The schedule is as follows:

Classes are in-person every Tuesday and Friday from 8 – 10 with the exception of statutory holidays. Labs are all in person on Wednesdays from 10 – 1. Labs take place every week unless otherwise indicated by the lab schedule.

COURSE DESCRIPTION

Students will study the modern view of atomic structure, nuclear chemistry, theories of bonding and molecular structure, organic chemistry (properties and reactions of the major functional groups and isomerism) after a brief review of stoichiometry, gases and the treatment of experimental data. Students will also perform experiments in the laboratory.

LEARNING OUTCOMES

A student who successfully completes the course will have reliably demonstrated the ability to:

- *Solve a variety of stoichiometric and gas law problems*
- *Solve problems based on the Bohr model of the atom, other 1-electron atomic systems and the photoelectric effect*
- *Use quantum theory to discuss orbital shapes, energies and electron configurations of atoms and ions*
- *Describe and explain trends in atomic and ionic radii, ionization energies, electron affinities, and electronegativities with reference to the Periodic Table of Elements*
- *Describe ionic and covalent bonding and explain trends in physical properties based on type of bonding*
- *Use Lewis structures and resonance to describe bonding and Valence Shell Electron Pair Repulsion (VSEPR) Theory to predict shapes of covalent species*
- *Use Valence Bond Theory and Molecular Orbital Theory to rationalize shapes, stabilities and magnetic properties of covalent species*
- *Describe the different intermolecular forces and explain effects of intermolecular forces on physical properties of covalent compounds*
- *Name a variety of organic compounds containing different functional groups*
- *Describe and illustrate different types of isomerism possible in organic compounds*
- *Predict the products of simple reactions involving organic compounds*
- *Discuss the common types of radioactivity and their uses*
- *Solve problems based on the rates of radioactive decay, binding energies of nuclei and energy associated with nuclear reactions*

TENTATIVE SCHEDULE OF TOPICS

Note: The end of the book only gives answers to odd-numbered questions, so only odd-numbered questions are referred to in the problems listed below.

- Chapter 1** **STOICHIOMETRY:** Molar mass, empirical and molecular formula determination, chemical equations, stoichiometric calculations including limiting reagents and percent yield, stoichiometric calculations including volumetric analysis. (4 lectures)
Problems: 1 – 27, 31 – 45, 49, 53 – 75, 79, 81, 85 – 117
- Chapter 2**
(omit 2.5) **GASES:** Measurement of properties of gases, effects of temperature and pressure on gases, ideal gas equation and STP conditions, gas mixtures and partial pressures, kinetic theory of gases, Graham's law of effusion, diffusion, real gases and the van der Waals equation. (2 lectures)
Problems: 5 – 29, 45, 47, 53 – 63, 67 – 73, 77 – 93, 97 – 103, 107 – 111
- Chapters 14**
(omit 14.3)
and 16.4 **CHEMICAL EQUILIBRIUM:** Equilibrium in chemical reactions, Le Chatelier's principle and effects of pressure, volume and temperature, K_c and K_p , calculations for gaseous systems, solubility products. (2 lectures)
Problems: Chapter 14: 1, 9 – 13, 25 – 37, 49, 51, 57, 63, 67, 71 – 75, 79, 81, 85
Chapter 16: 31 – 37, 55, 63, 65, 69, 73, 75, 83, 85, 89, 103
- Chapters 15**
(omit 15.6)
and 16.1 - 16.3 **ACIDS AND BASES:** Review of acid-base fundamentals, weak acids and bases, buffers, hydrolysis, polyprotic acids, indicators, titration curves. (3 lectures)
Problems: Chapter 15: 1 – 44, 51 – 73, 77
Chapter 16: 1 – 29, 53, 57 – 61, 67, 71, 77, 93, 95
- Chapter 3**
(Omit 3.6) **HEAT, WORK & ENERGY:** Thermodynamic terms and concepts, heat and PV work, First Law of Thermodynamics, heats of reactions, calorimetry and Hess' law. (3 lectures)
Problems: 1, 3, 9 – 21, 31 – 45, 53 – 57, 63, 69, 73 – 77, 83 – 93, 99
- Chapters 12**
(omit 12.6)
and 14.3 **ENTROPY AND FREE ENERGY:** Reversible and irreversible processes, disorder, entropy and the Second Law of Thermodynamics, Third Law of Thermodynamics and entropy changes, Gibbs free energy and equilibrium, temperature dependence of equilibrium constant. (3 lectures)
Problems: Chapter 12: 11 – 23, 27 – 47, 55 – 65, 69, 77, 81 – 85, 89, 95, 105, 107
Chapter 14: 17 – 23, 65, 69
- Chapter 17**
(Omit 17.1 and 17.2) **ELECTROCHEMISTRY:** Fundamentals of electrochemical cells, thermodynamics of electrochemical cells, application of Galvanic cells, electrolysis, corrosion. (3 lectures)
Problems: 17, 21, 25 – 75, 79 – 93, 97, 101 - 105

Chapters 8 and 9 (Omit 8.4, 8.5) **LIQUIDS AND SOLUTIONS:** Properties of liquids, phase changes and phase diagrams of one-component systems, properties of solutions and concentration units, colligative properties for non-electrolyte and electrolyte solutions, Raoult's law and distillation. *(3 lectures)*

Problems: Chapter 8: 1, 11, 15, 17, 21 – 27, 51, 59, 63, 81, 85, 97
Chapter 9: 1 – 19, 39, 43 – 47, 55 – 69, 73, 83

Chapter 8.4, 8.5 **SOLIDS:** Unit cells and crystal lattices, metallic crystals, ionic crystals. *(2 lectures)*

Problems: 35 – 39, 43, 49, 61, 79, 87, 101

REQUIRED TEXTBOOKS AND MATERIALS:

Chemistry 1154 lab manual, one laboratory notebook, and a lab coat

Contact lenses may not be worn in the laboratory. Glasses are therefore required for people who normally wear contact lenses.

Calculator: Sharp EL-531 or equivalent non-programmable

Textbook (optional): Chemistry (4th Canadian Edition), by Olmsted, Williams, and Burk (looseleaf edition or eText)

DETAILED SUMMARY OF EVALUATION SCHEME

Lecture		Laboratory	
Three Exams	40	Lab Reports/Unknowns	22
Final Exam	30	Lab Exam	8

What follows are the guidelines used to determine your final grade in Chemistry 1110. Please note the restrictions placed on your grade by both the lab component of the course and your performance on the final exam.

To get a(n):	Your overall mark (including the final and lab) must be:	And within that, you must get at least the following on the final:	And in the Lab:
A+	90 – 100	80%	All work must be complete, and you must have an overall lab mark of at least 65%
A	85 – 89	70%	
A-	80 – 84	65%	
B+	76 – 79	60%	All work must be complete, and you must have an overall lab mark of at least 60%
B	72 – 75	60%	
B-	68 – 71	55%	
C+	64 – 67	50%	All work must be complete, and you must have an overall lab mark of at least 50%
C	60 – 63	40%	
C-	56 – 59	40%	
D	50 – 55	N/A	N/A
F	<50	N/A	N/A

Here is how KPU will interpret your grade:

Grade	Grade Points	Conversion Scale (%)	Definition
A+	4.33	90 - 100	Exceptional Achievement
A	4.00	85 - 89	Outstanding Achievement
A-	3.67	80 - 84	Excellent Achievement
B+	3.33	76 - 79	Very Good Achievement
B	3.00	72 - 75	Good Achievement
B-	2.67	68 - 71	Good Achievement
C+	2.33	64 - 67	Satisfactory Achievement
C	2.00	60 - 63	Satisfactory Achievement
C-	1.67	56 - 59	Minimal Achievement. This grade does not permit student to pursue another course for which the graded course was a prerequisite.
D	1.00	50 - 55	Minimal achievement. This grade does not permit student to pursue another course for which the graded course was a prerequisite.
F	0.00	0 - 49	Unsatisfactory achievement. Student did not meet minimum course requirements.

INSTRUCTOR/CLASSROOM POLICIES:

Any in-class exam not written by the student will be assigned a grade of zero unless the student can produce relevant documentation supporting the necessity of their absence. If such documentation is produced, the weights of the other exams will be increased so that the student will not be penalized for missing the exam. If the student is unable to write an exam, he or she must notify the instructor before the scheduled exam time. Labs missed without a valid excuse will result in an incomplete grade being assigned to the laboratory portion of the course.

Students requiring accommodation for a disability in chemistry 1110 must ensure that the accommodation notice (from a Disability Advisor) covers both the lecture and the lab. A lab assistant accommodation must be approved by a Disability Advisor; the student must arrange this before the first lab. The Chemistry Department may provide suggestions regarding finding a suitable lab assistant, however finding a lab assistant remains a student responsibility.

ADDITIONAL COSTS TO STUDENTS

Students are responsible to provide their own cloth face masks and any other Personal Protective Equipment specific to this course.

IMPORTANT DATES

For important information on deadlines for refunds, last day to add or drop a course, withdrawal, etc., please go to the Dates and Deadlines page in the Registration Guide:

<https://www.kpu.ca/registration/dates>

Term test #1	September 29 (Friday)
Term test #2	October 27 (Friday)
Term test #3	November 24 (Friday)
Final Chemistry 1154 lecture	December 1 (Friday)
Final exam period	December 6 – 14
CHEM 1154 Final Exam (8:30 – 11:30 AM, Room TBA)	December 8 (Friday)

KPU POLICIES

All KPU policies can be found at: www.kpu.ca/policies

Policy No. HR15 – Diversity and Inclusiveness

Policy No. ST2 – Student Academic Integrity

Policy No. ST11 – Attendance and Performance in Semester and Other Term Based Courses

Policy No. ST7 – Student Conduct (Non-Academic)

Policy No ST14 – Services for Students with Disabilities

LEARNING SUPPORT AND ACCOMMODATIONS

Early Alert System

During the course of the semester, if I am concerned about your progress, I may use the Early Alert Response System (EARS) to connect you with services who will work with you to find additional resources or supports that may increase your chances of success. Such assistance may include putting you in touch with an academic advisor, a tutor, financial aid, a counsellor, or another faculty member. Please be advised that the information is shared with those on a need to know basis and is sent because I care about your progress and success in this course. For more information check the website – <https://www.kpu.ca/advising/earlyalert>

Accessibility Services

KPU is committed to creating a learning environment that meets the needs of all the learners. If you anticipate or experience disability-related issues or barriers in this course, please meet with me. Together we can plan how to best support your learning and coordinate your accommodations. You are also encouraged to contact Accessibility Services at kpu.ca/access or email access@kpu.ca or call 604-599-2001

Other student services:

[Academic Advising](#) – please see an advisor if you have questions about course selection, program declaration, or program progression. If you are domestic student consult Central advising in year 1 or 2 and a Science advisor in year 3 or 4. If you are an international student, please consult an international advisor.

[Counselling Services](#) – please see a counsellor for any personal concerns or if you are needing extra support.

[The Learning Centres](#) – Please consult with learning centre tutors or learning strategists for any academic support you require. All services are FREE!

[KPU Academic Integrity Moodle Course](#)

[Student Rights and Responsibilities](#)

[IMPORTANT Dates and Deadlines for KPU students](#)