

**CHEM 102A – Introductory University Chemistry II***3 credits, 4 hours lecture, 3 hours lab*

Rates of reactions, thermodynamics and equilibrium, electrochemistry, modern applications of chemistry.

*Prerequisite: CHEM 101*

**Instructor**

Dr. Sean Fenwick

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**Office Hours**

Mondays 2:00 – 4:00 pm  
Thursdays 2:00 – 3:00 pm  
Fridays 10:00 – 12:00 am

**Hours of Instruction**

<i>Lecture:</i>	Tuesdays	2:00 – 3:50 pm	CC-228
	Thursdays	11:30 am – 12:30 pm	CC-228
	Fridays	2:00 – 2:50 pm	CC-224
<i>Laboratory:</i>	Wednesdays	2:00 – 4:50 pm	CC-236

**Required Resources**

1. **General Chemistry: Principles & Modern Applications**; Petrucci, Herring, Madura, Bissonnette; Pearson Canada Inc., Toronto, Ontario, 2017, 11<sup>th</sup> edition, ISBN 978-0-13-293128-1.  
*The 10<sup>th</sup> edition of this textbook is also acceptable.*
2. **Chemistry 102/105 Laboratory Manual**; Keyano College, 2016/2017 edition.  
*The old editions of the lab manual are not acceptable.*
3. **Student Lab Notebook with Permanent Binding**; Hayden-McNeil, Plymouth, Michigan, ISBN 978-1-930882-00-3
4. A non-programmable scientific calculator (Sharp EL-531, used for exams, is recommended).
5. Extra long lab coat.

**Course Outcomes**

Upon successful completion of this course, the student shall be able to:

- Perform analytical and chemical kinetics experiments using laboratory equipment, and use proper laboratory safety procedures
- Explain chemical processes using physical chemistry methods, either employing the kinetics approach or the thermodynamics approach
- Analyze chemical equilibrium using Le Châtelier's principle, and perform equilibrium calculations using an ICE table for acid-base equilibria, solubility equilibria, and complex ion equilibria

- Explain electronic configurations of coordination compounds using Crystal Field Theory, and correlate it with their properties like color and paramagnetic-diamagnetic character
- Understand how the electrochemical cells operate, calculate their standard potential, and correlate the potential to the ionic concentrations in each half cell using Nernst equation

### Evaluation

Assignments	10%
Laboratory	25%
Midterm Exam	25%
Final Exam	40%
Total	100%

*A grade of C- is required for progression or transfer.*

### Grading System

Descriptor	Alpha Grade	4.0 Scale	Percent	Rubric for Letter Grades
Excellent	A+	4.0	> 92.9	Work shows in-depth and critical analysis, well developed ideas, creativity, excellent writing, clarity and proper format.
	A	4.0	85 – 92.9	
	A-	3.7	80 – 84.9	
Good	B+	3.3	77 – 79.9	Work is generally of high quality, well developed, well written, has clarity, and uses proper format.
	B	3.0	74 – 76.9	
	B-	2.7	70 – 73.9	
Satisfactory <b>Progression</b>	C+	2.3	67 – 69.9	Work has some developed ideas but needs more attention to clarity, style and formatting.
	C	2.0	64 – 66.9	
	C-	1.7	60 – 63.9	
Poor <b>Minimum Pass</b>	D+	1.3	55 – 59.9	Work is completed in a general way with minimal support, or is poorly written or did not use proper format.
	D	1.0	50 – 54.9	
Failure	F	0.0	< 50	Responses fail to demonstrate appropriate understanding or are fundamentally incomplete.

### Proposed Schedule of Topics

1. Chemical Kinetics	textbook chapters
• Reaction rates and rate laws	20.1-20.3
• Integrated rate laws	20.4-20.6
• Arrhenius model and reaction mechanism	20.7-20.10
• Catalysis	20.11
2. Equilibrium	
• Gas-phase equilibria	15.1-15.2
• ICE table and equilibrium calculations	15.3-15.5
• Le Chatelier's principle	15.6-15.7
• Acid-base equilibria	16.1-16.9
• Buffers, Indicators	17.1-17.6
• Solubility, precipitation, complex ion equilibria	18.1-18.8

### 3. Coordination Chemistry

- Coordination compounds and isomers 24.1-24.4
- Localized electron model, Crystal field theory 24.5-24.9
- Importance of coordination compounds 24.10-24.11

### 4. Thermodynamics

- First law: energy, heat and work 7.1-7.4
- Enthalpy, bond energies and first law 7.5-7.6
- Hess' law, Sources of Energy 7.7-7.9
- Second and third laws: entropy and spontaneity 13.1-13.3, 13.5
- Free energy, work and equilibrium 13.4, 13.6-13.8

### 5. Electrochemistry

- Voltaic cells, cell potentials 19.1-19.2
- Free energy and electrical work 19.3
- The Nernst equation 19.4
- Applications: batteries, corrosion, electrolysis 19.5-19.8

**Please Note:**

Date and time allotted to each topic is subject to change.

## Performance Requirements

### Student Responsibilities

It is your responsibility as a student to contact the Office of the Registrar to complete the forms for Withdrawal or Change of Registration, and any other forms. Please refer to the list of important dates as noted in the Academic Schedule in the Keyano College credit calendar.

More specific details are found in the Student Rights and Student Code of Conduct section of the Keyano College credit calendar. It is the responsibility of each student to be aware of the guidelines outlined in the Student Rights and Student Code of Conduct Policies.

### Laboratory Safety

In the science laboratories, safety is important.

Students must complete the *WHMIS for Students* online training course on Moodle before entering the science laboratories.

Students must comply with the mandatory laboratory safety rules for this course as provided in the laboratory manual. Failure to do so will result in progressive discipline such as a verbal warning, refused entry into the laboratory, or suspension from the College.

### Student Attendance

Class attendance is useful for two reasons. First, class attendance maximizes a students' learning experience. Second, attending class is a good way to keep informed of matters relating to the administration of the course (e.g., the timing of assignments and exams). Ultimately, you are responsible for your own learning and performance in this course.

It is the responsibility of each student to be prepared for all classes. Students who miss classes are responsible for the material covered in those classes and for ensuring that they are prepared for the next class, including the completion of any assignments and / or notes that may be due.

**Academic Misconduct**

Students are considered to be responsible adults and should adhere to principles of intellectual integrity. Intellectual dishonesty may take many forms, such as:

- Plagiarism or the submission of another person's work as one's own
- The use of unauthorized aids in assignments or examinations (cheating)
- Collusion or the unauthorized collaboration with others in preparing work
- The deliberate misrepresentation of qualifications
- The willful distortion of results or data
- Substitution in an examination by another person
- Handing in the same unchanged work as submitted for another assignment
- Breach of confidentiality.

The consequences for academic misconduct range from a verbal reprimand to expulsion from the College. More specific descriptions and details are found in the Student Rights and Student Code of Conduct section of the Keyano College credit calendar. It is the responsibility of each student to be aware of the guidelines outlined in the Student Rights and Student Code of Conduct Policies.

In order to ensure your understanding of the concept of plagiarism, you must successfully complete the online tutorial found on [ilearn.keyano.ca](http://ilearn.keyano.ca). Then print the certificate, sign it, and show it to each of your instructors. Your course work will not be graded until you show this signed certificate.

**Specialized Supports****Counselling and Accessibility Services**

Counselling Services provides a wide range of specialized counselling services to prospective and registered students, including personal, career and academic counselling.

**SKILL Centre**

The SKILL Centre is a learning space in the Clearwater Campus at Keyano College where students can gather to share ideas, collaborate on projects and get new perspectives on learning from our tutorial staff.

The SKILL Centre, through a variety of delivery methods, provides assistance in skill development to Keyano students. Assistance is provided by instructors, staff and student tutors. Individuals wishing to improve their mathematics, writing, grammar, study, or other skills, can take advantage of this unique service.

**Authorization**

This course outline has been reviewed and approved by the Program Chair.

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Sean Fenwick, Instructor

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Louis Dingley, Chair

Date Authorized

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Vincella Thompson, Dean

Date Authorized

**Signed copies to be delivered to:**

Instructor

Registrar's Office