

CHEM 102A – Introductory University Chemistry II

3 credits, 16 weeks, 4 hours lecture, 3 hours lab

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

Prerequisite: CHEM 101

Instructor

Dr. Sorin Nita

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Office Hours

Monday 9:00 AM – 12:00 PM

Tuesday 10:00 AM – 11:00 AM

Friday 10:00 AM – 11:00 AM

Hours of Instruction

Monday 3:00 PM – 4:00 PM

Room 273

Tuesday 11:00 AM – 12:00 PM

Room 228

Wednesday 9:00 AM – 12:00 PM

Lab 236

Friday 1:00 PM – 3:00 PM

Room 228

Required Resources

1. **General Chemistry: Principles & Modern Applications**; Petrucci, Herring, Madura, Bissonnette; Pearson Canada Inc., Toronto, Ontario, 2011, 10th edition, ISBN 978-0-13-612149-7.
The 9th edition of this textbook is also acceptable.
2. **Chemistry 102/105 Laboratory Manual**; Keyano College, 2014/2015 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

The student will be able to:

1. Perform analytical and chemical kinetics experiments using laboratory equipment, and use proper laboratory safety procedures
2. Explain chemical processes using physical chemistry methods, either employing the kinetics approach or the thermodynamics approach
3. 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
4. Explain electronic configurations of coordination compounds using Crystal Field Theory, and correlate it with their properties like color and paramagnetic-diamagnetic character

5. 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	20%
Final Exam	45%
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 Progression	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 Minimum Pass	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
<ul style="list-style-type: none"> • Reaction rates and rate laws • Integrated rate laws • Arrhenius model and reaction mechanism • Catalysis 	14.1-14.3 14.4-14.6 14.7-14.10 14.11
2. Equilibrium	
<ul style="list-style-type: none"> • Gas-phase equilibria • ICE table and equilibrium calculations • Le Chatelier's principle • Acid–base equilibria • Buffers, Indicators • Solubility, precipitation, complex ion equilibria 	15.1-15.2 15.3-15.5 15.6-15.7 16.1-16.9 17.1-16.6 18.1-18.9

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 7.1-7.5
- Enthalpy, bond energies and calorimetry 7.3-7.6
- Hess' law, Sources of Energy 7.7-7.9
- Second and third laws: entropy and spontaneity 16.1-16.3, 16.5
- Free energy, work and equilibrium 16.4, 16.6-16.9

5. Electrochemistry

- Voltaic cells, cell potentials 20.1-20.2
- Free energy and electrical work 20.3
- The Nernst equation 20.4
- Applications: batteries, corrosion, electrolysis 20.5-20.8

Please Note:

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

Performance Requirements

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 student's 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

Penalties for academic offences range from a verbal reprimand to dismissal from the College, and in certain circumstances may involve legal action.

Specialized Supports**Counselling and Disability 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.

[First Name, Last Name], Instructor

[First Name, Last Name], Chair

Date Authorized

Guy Harmer, Dean

Date Authorized

Signed copies to be delivered to:

Instructor

Registrar's Office