

Chemistry 2214B Physical Chemistry for Life Sciences Winter 2026

Course Outline

1. Course Information

Course Information

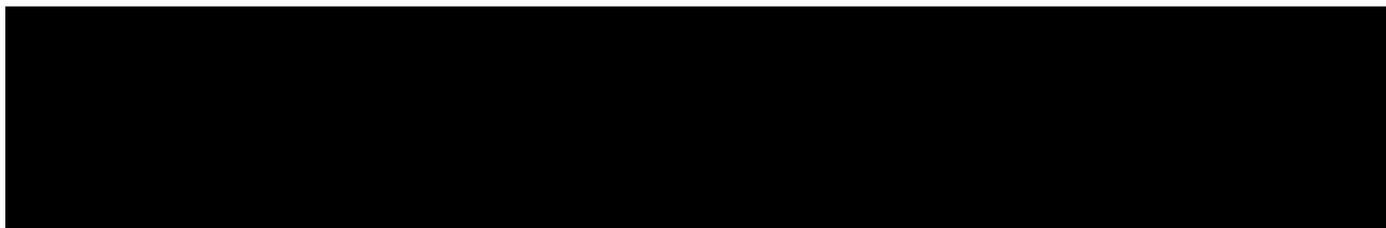


Prerequisite(s)

(Chemistry 1301A/B and Chemistry 1302A/B) or (Chemistry 1301A/B and Integrated Science 1001X); 0.5 course from: Calculus 1000A/B or 1500A/B; and 0.5 course from: Applied Mathematics 1201A/B, Calculus 1301A/B, 1501A/B, Mathematics 1225A/B, 1229A/B, or 1600A/B. Anti-requisites: Chemistry 2374A, 2384B.

Unless you have either the prerequisites for this course or written special permission from the Department of Chemistry to enroll in it, you may be removed and withdrawn from this course in accordance with university policy. This may be done after the add/drop deadline of the academic term, and the course will be marked as withdrawn (WDN) on your academic record. This decision may not be appealed.

2. Instructor Information



Students must use their Western (@uwo.ca) email addresses when contacting their instructors. Include "Chem 2214" in the subject line. Emails from non-uwo servers will be ignored.

3. Course Syllabus, Schedule, Delivery Mode

Course Description

Basic thermodynamic concepts and relations and illustration of their relevance and applications to biological systems. In addition, some aspects of electrochemistry and spectroscopic techniques will be introduced, again with emphasis on the role of these techniques in understanding the structure and nature of important biological molecules.

Course Topics

| Topic (tentative) | Tinoco (5th ed.) |
|--------------------------------------------------------------------------------------------------------------------------------------|------------------|
| 1. Introduction | Ch. 1-2 |
| 2. The properties of gases - Ideal gas law and van der Waals equation of state | Ch. 2 |
| 3. The first law of thermodynamics - Work, heat, expression of the first law, enthalpy, internal energy - Thermochemistry | Ch. 2 |
| 4. The second law of thermodynamics - Entropy and Gibbs free energy | Ch. 3 |
| 5. Physical equilibria - Temperature and pressure dependence of Gibbs free energy - The phase diagram | Ch. 4, 6 |
| 6. Chemical equilibrium - Relation between the equilibrium constant and ΔG - Electrochemistry | Ch. 4, 7 |
| 7. The thermodynamic description of mixtures - Ideal solutions, Raoult's law, Henry's law, colligative properties | Ch. 6 |
| 8. Transport processes - Diffusion and diffusion coefficient - Fick's first and second laws - Solvation and sedimentation | Ch. 8 |
| 9. Spectroscopy - Beer's Law; UV-Visible spectroscopy and fluorescence - Infrared spectroscopy; other spectroscopic techniques | Ch. 13-14 |

Learning Outcomes

Upon successful completion of this course, the student is expected to demonstrate the ability to:

- Describe the basic principles of thermodynamics and other selected physical chemistry topics.
- Solve problems by correctly formulating the physical/chemical processes and executing calculations.
- Conduct physical chemistry laboratory experiments efficiently and with in-depth understanding.
- Compile professional standard lab reports with critical data analysis.
- Work independently and efficiently for course work and the lab.

Delivery Mode

Lectures will be delivered in-person at the scheduled lecture time and classroom.

| Experiment | Lab | Lab report due |
|---------------------------|--------------------------------|----------------------|
| Vapour pressure | Fri Jan 30, 9:30 am - 12:30 pm | Fri Feb 06, 11:55 pm |
| Electromotive force | Fri Feb 13, 9:30 am - 12:30 pm | Fri Feb 27, 11:55 pm |
| Freezing point depression | Fri Mar 06, 9:30 am - 12:30 pm | Fri Mar 13, 11:55 pm |
| Diffusion | Fri Mar 20, 9:30 am - 12:30 pm | Fri Mar 27, 11:55 pm |

Important Lab Information

- Lab safety: Lab coat, safety glasses, proper footwear (shoes must cover the entire foot), socks, and ankle-length pants must be worn.
- Late arrivals: Any student who arrives after the doors to the lab have closed, when the TA talk begins, is considered late and will not be permitted to do the experiment (mark of zero).
- During experiments, obtain approval from the TA before leaving the laboratory and return within a reasonably short period.
- Students will work in pairs or groups of three due to limited resources. Each student must learn all aspects of the experiment and write their own lab report independently.

4. Course Materials

All course material will be posted to OWL: <https://westernu.brightspace.com/>

Required lab manual: *2025-2026 Chemistry 2214 Laboratory Manual* (to be purchased from the Campus eBookstore; Cost: \$26). **Second-hand or older editions will not be sufficient.**

Optional textbook: *Physical Chemistry - Principles and Applications in Biological Sciences*, Tinoco (5th edition, Pearson). Cost: ~\$107 (used); ~\$190 (new) on Amazon.ca. Earlier editions are acceptable.

Useful reference: *Elements of Physical Chemistry*, P. Atkins and J. de Paula (6th edition by W. H. Freeman & Company, or 5th edition by Oxford University Press). Cost: ~\$25 on Amazon.ca

A smart phone, tablet, laptop, or other web-enabled device will be used for the iClicker component during class.

Students are responsible for checking the course OWL site (<https://westernu.brightspace.com/>) regularly for news and updates. This is the primary method by which information will be disseminated to all students in the class.

If students need assistance with the course OWL site, they can seek support on the [OWL Brightspace Help](#) page. Alternatively, they can contact the Western Technology Services Helpdesk. They can be contacted by phone at 519-661-3800 or ext. 83800.

5. Methods of Evaluation

Grading Scheme and Assessment Dates

The overall course grade, out of 100, will be calculated as listed below:

| Component | Value | Notes / date |
|--------------------------|-------|----------------------------|
| Laboratory (lab reports) | 20% | 4 labs, 5% each |
| Homework Assignments | 20% | 4 problem sets, 5% each |
| Midterm Test | 25% | Fri Feb 27, 7:00 - 9:00 PM |
| Final Exam | 35% | Scheduled by the Registrar |

General information about missed coursework

Students must familiarize themselves with the *University Policy on Academic Consideration – Undergraduate Students in First Entry Programs*, posted on the Academic Calendar:

https://uwo.ca/univsec/pdf/academic_policies/appeals/academic_consideration_Sep24.pdf

This policy does not apply to requests for Academic Consideration submitted for **attempted or completed work**, whether online or in person.

The policy also does not apply to students experiencing longer-term impacts on their academic responsibilities. These students should consult [Accessible Education](#).

For procedures on how to submit Academic Consideration requests, please see the information posted on the Office of the Registrar's webpage: https://registrar.uwo.ca/academics/academic_considerations/
All requests for Academic Consideration must be made within 48 hours after the assessment date or submission deadline.

When a student *mistakenly* submits their one allowed Academic Consideration request **without supporting documentation** for the assessments listed above or those in the **Coursework with Assessment Flexibility** section below, the request cannot be recalled and reapplied. This privilege is forfeited.

Evaluation Scheme for Missed Assessments

Missed lab. If you miss a scheduled lab session for a valid reason, submit an Academic Consideration request. With approved consideration, the missed lab will be excused (labs cannot be made up). If a lab is excused, the lab mark will be based on the remaining labs. If you attended a lab but missed the lab report deadline for a valid reason, Academic Consideration may allow an extension or the lab to be excused.

Missed homework assignment. If you cannot submit an assignment by the due time for a valid reason, submit an Academic Consideration request. With approved consideration, that assignment will be excused and the homework mark will be based on the remaining assignments.

Missed midterm test. If you miss the midterm for any reason, no Academic Consideration is needed. The weight of the midterm will be automatically transferred to the final exam. There is no make-up midterm. When a student misses the Final Exam and their Academic Consideration has been granted, they will be allowed to write the Special Examination (the name given by the University to a makeup Final Exam). See the Academic Calendar for details (under [Special Examinations](#)), especially for those who miss multiple final exams within one examination period.

Late submissions

Late submission penalty (without approved Academic Consideration):

- Homework assignments: 25% per day late for up to two days; after the third day, the assignment is no longer accepted and a mark of zero is assigned.
- Lab reports: 10% per day late for up to five days; after the sixth day, the report is no longer accepted and a mark of zero is assigned.

iClicker participation (bonus marks)

Up to 2 bonus marks may be awarded toward the overall course mark via participation in in-class iClicker activities by responding to questions (correctly or incorrectly):

- 1) 2 marks if you respond to 75% or more of questions over the term;
- 2) 1 mark if you respond to 50% to 75% of questions;
- 3) 0 marks if you respond to less than 50% of questions.

Bonus marks will only be added if you have achieved a passing course grade without any bonus marks.

Equal opportunity and evaluation policy

All students will be treated equally and evaluated using the criteria presented in this course outline and their respective weights. The evaluation criteria are based strictly on actual achievement, not on effort. There is no extra work available for extra credit or to "make up" another grade, and requests for grade increases will not be granted.

Essential Learning Requirements

Even when Academic Considerations are granted for missed coursework, the following are deemed essential to earn a passing grade:

- Attend at least 2 of the 4 labs and submit at least 2 lab reports;
- Obtain an average mark of at least 50% on the laboratory component;
- Write the final exam; and
- Obtain at least 50% on either the midterm test or the final exam.

Students who fail to meet any of these requirements will receive a course grade of not greater than 40%, even if the calculated grade is higher.

Students unable to complete the minimum number of labs or lab reports for medical or compassionate reasons may apply for Incomplete Standing (INC) through their Faculty/College, and complete the missed items the next time the course is offered.

6. Additional Statements

6.1 Religious Accommodation

When a recognized religious holiday or observance conflicts with an examination, test, or other scheduled academic obligation, students must request accommodation via the University's Student Absence Portal (SAP). This request should identify the conflict and specify which course component(s) (e.g. test, midterm, exam) are affected.

Students are encouraged to submit the SAP request as early as possible, but no later than two weeks before any examination, or one week before any mid-term test or quiz, to allow sufficient time for adjustment.

The SAP request serves as official notification to both the course instructor and the Academic Advising Office, in accordance with University policy:

https://www.uwo.ca/univsec/pdf/academic_policies/appeals/accommodation_religious.pdf

The Faculty of Science considers religious accommodations as scheduling conflicts. Instructors should provide either a make-up exam or an earlier sitting of the same exam to accommodate the student.

For more information on recognized religious holidays, please visit the Diversity Calendar posted on the Equity, Diversity & Inclusion website - <https://www.edi.uwo.ca>

6.2 Academic Accommodation Policies

Students with disabilities are encouraged to contact Accessible Education, which provides recommendations for accommodation based on medical documentation or psychological and cognitive testing. The policy on Academic Accommodation for Students with Disabilities can be found at:

https://www.uwo.ca/univsec/pdf/academic_policies/appeals/Academic_Accommodation_disabilities.pdf.

6.3 General Academic Policies

The website for Registrar Services is <https://www.registrar.uwo.ca/>.

Use of @uwo.ca email: In accordance with policy, https://www.uwo.ca/univsec/pdf/policies_procedures/section1/mapp113.pdf, the centrally administered e-mail account provided to students will be considered the individual's official university email address. It is the responsibility of the account holder to ensure that emails received from the University at their official university address are attended to in a timely manner.

Requests for Relief (formerly known as “appeals”)

Policy on Request for Relief from Academic Decision:

https://uwo.ca/univsec/pdf/academic_policies/appeals/requests_for_relief_from_academic_decisions.pdf

Procedures on Request for Relief from Academic Decision (Undergraduate):

https://uwo.ca/univsec/pdf/academic_policies/appeals/undergrad_requests_for_relief_procedure.pdf

6.4 Scholastic Offences

Policy on Scholastic Offences:

https://uwo.ca/univsec/pdf/academic_policies/appeals/scholastic_offences.pdf

Procedures on Scholastic Offences (Undergraduate):

https://uwo.ca/univsec/pdf/academic_policies/appeals/undergrad_scholastic_offence_procedure.pdf

Use of Electronic Devices During Assessments

In courses offered by the Faculty of Science, the possession of unauthorized electronic devices during any in-person assessment (such as tests, midterms, and final examinations) is strictly prohibited. This includes, but is not limited to: mobile phones, smart watches, smart glasses, and wireless earbuds or headphones. **Unless explicitly stated otherwise in advance by the instructor, the presence of any such device at your desk, on your person, or within reach during an assessment will be treated as a**

scholastic offence, even if the device is not in use. Only devices expressly permitted by the instructor (e.g., non-programmable calculators) may be brought into the assessment room. It is your responsibility to review and comply with these expectations.

Use of Generative AI Tools

Unless otherwise stated, the use of generative AI tools (e.g., ChatGPT, Microsoft Copilot, Google Gemini, or similar platforms) is **not permitted** in the completion of any course assessments, including but not limited to: assignments, lab reports, presentations, tests, and final examinations. Using such tools for content generation, code writing, problem solving, translation, or summarization—when not explicitly allowed—will be treated as a **scholastic offence**. If the use of generative AI is permitted for a particular assessment, the conditions of use will be specified by the instructor in advance. If no such permission is granted, students must assume that use is prohibited. It is your responsibility to seek clarification before using any AI tools in academic work.

6.5 Support Services

Please visit the Science & Basic Medical Sciences Academic Advising webpage for information on adding/dropping courses, academic considerations for absences, requests for relief, exam conflicts, and many other academic-related matters: <https://www.uwo.ca/sci/counselling/>.

Students who are in emotional/mental distress should refer to Mental Health@Western (<https://uwo.ca/health/>) for a complete list of options about how to obtain help.

Western is committed to reducing incidents of gender-based and sexual violence (GBSV) and providing compassionate support to anyone who has gone through these traumatic events. If you have experienced GBSV (either recently or in the past), you will find information about support services for survivors, including emergency contacts, at:

https://www.uwo.ca/health/student_support/survivor_support/get-help.html.

To connect with a case manager or set up an appointment, please contact support@uwo.ca.

Please contact the course instructor if you require lecture or printed material in an alternate format or if any other arrangements can make this course more accessible to you. If you have any questions regarding accommodations, you may also wish to contact Accessible Education at

http://academicsupport.uwo.ca/accessible_education/index.html

Learning-skills counsellors at Learning Development and Success (<https://learning.uwo.ca>) are ready to help you improve your learning skills. They offer presentations on strategies for improving time management, multiple-choice exam preparation/writing, textbook reading, and more. Individual support is offered throughout the Fall/Winter terms in the drop-in Learning Help Centre, and year-round through individual counselling.

Additional student-run support services are offered by the USC, <https://westernusc.ca/services/>.