

CHEM4400B

Radiation, Nuclear, and Radiopharmaceutical Chemistry

Winter 2026

1. Course Information



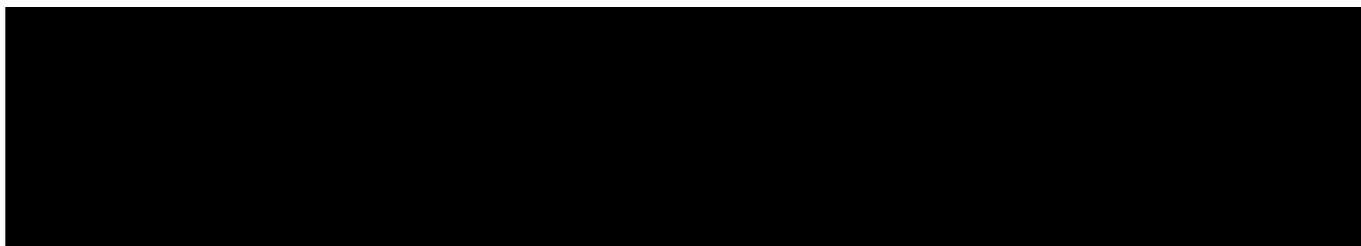
This survey course introduces students to the chemical principles of nuclear transformations, radiation interactions, and the development and use of radiopharmaceuticals. Emphasis is placed on the role of nuclear chemistry in the energy sector, healthcare (diagnostics and therapy), and environmental applications. Students will gain experience in fundamental nuclear theory, practical radiochemical methods, and safety protocols.

List of Prerequisites

CHEM1301A/B and (CHEM1302A/B or Integrated Science 1001X).

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for this course or written special permission from the Department of Chemistry to enroll in it, you may be removed and withdrawn from this course in accordance with university policy. This may be done after the add/drop deadline of the academic term, and the course will be marked as withdrawn (WDN) on your academic record.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.

When emailing your instructor(s), please include *CHEM4400B* in the subject line. Messages from a non-Western account or those that do not include *CHEM4400B* may be blocked by the university's anti-spam system. It is also useful to include your student number somewhere in the message.

3. Course Learning Outcomes and Syllabus

Learning Outcomes:

- Describe the principles of radioactive decay, nuclear reactions, and radiation-matter interactions.
- Explain how radioisotopes are produced and applied in medicine, energy, and research.
- Analyze radiation detection methods and dosimetry practices.
- Discuss radiolysis and radiation-induced chemical effects.
- Evaluate ethical and safety concerns associated with nuclear/radiation use.
- Critically assess literature and current challenges in nuclear and radiopharmaceutical chemistry.

Course Topics (time permitting):

1. Definitions, Terms, and Sources of Ionizing Radiation
2. Nuclear Reactor and Waste Chemistry
3. Radiation-Matter Interactions
4. Water Radiolysis and Radiation Chemistry
5. Radiation Damage and Materials Chemistry
6. Radiation Detection and Dosimetry
7. Radiopharmaceutical Chemistry
8. Applications of Nuclear Chemistry and Safety, Ethics, and Societal Considerations

4. Course Materials

- Instructor-provided lecture notes and selected readings.
- Basic non-programmable calculator.
- Laptop/tablet with stable internet connection for Brightspace webpage access in class.

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

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

The overall course grade will be calculated as listed below:

<u>Component</u>	<u>Weight</u>
Weekly in-class quizzes (7 total)	15%
Midterm Tests (in-class, 2 total)	50% (25% each)
Written report*	20%
Presentation*	10% (5% from instructor(s), 5% from peer review)
Peer Review of Presentations**	5%

*The written report and presentation are to be on the same topic. Students will choose a topic from a provided list on nuclear related disasters/accidents, or nuclear/radiation research. More information will be provided throughout the course.

**Learning how to be critical is a skill. In this course, students will learn this skill through mandatory peer review of grading classmate presentations. More information will be provided throughout the course.

Dates to Note

<u>Date</u>	<u>Event</u>
Monday, January 5, 2026	Class begins
Friday, January 9, 2026	Quiz 1 (in-class)
Friday, January 16, 2026	Quiz 2 (in-class)
Friday, January 23, 2026	Quiz 3 (in-class)
Friday, January 30, 2026	Quiz 4 (in-class)
Monday, February 9, 2026	Midterm Test 1 (in-class, topic cut-off TBA)
Week of February 14, 2026	Winter Reading Week
Friday, February 27, 2026	Quiz 5 (in-class)
Friday, March 6, 2026	Quiz 6 (in-class)
Friday, March 13, 2026	Quiz 7 (in-class)
Monday, March 23, 2026	Midterm Test 2 (in-class, topic cut-off TBA)
Thursday, April 9, 2026	Class ends, written report due

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.

All Academic Consideration requests must include supporting documentation; however, recognizing that formal documentation may not be available in some extenuating circumstances, the policy allows students to make one Academic Consideration request **without supporting documentation** in this course. However, the following assessments are excluded from this and, therefore, always require formal supporting documentation:

- Presentation and written report
- One of the two Midterm Tests

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

Component

Weekly in-class quizzes (7 total)	Reweighting to other quizzes
Midterm Tests (in-class, 2 total)	Reweighting to the other midterm (one Midterm is mandatory)
Written report	Mandatory
Presentation	Mandatory
Peer Review of Presentations	Pass/Fail

Late Submissions

Written reports submitted past the initial deadline (April 9th, 2026) will automatically receive a 25% reduction in the grade awarded, followed by a reduction of 10% for each of the following weeks it is late. For late submissions of written reports past the deadline (April 9th, 2026), the last possible date of submission that will be accepted is April 30th (even with Academic Consideration granted). After this submission cut-off date (April 30th), the grade of the written report will be reweighed to the lowest of the two midterm test grades.

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 (formally 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.

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.

All required papers may be subject to submission for textual similarity review to the commercial plagiarism detection software under license to the University for the detection of plagiarism. All papers submitted for such checking will be included as source documents in the reference database for the purpose of detecting plagiarism of papers subsequently submitted to the system. Use of the service is subject to the licensing agreement, currently between The University of Western Ontario and Turnitin.com (<http://www.turnitin.com>).

Computer-marked multiple-choice tests and exams may be subject to submission for similarity review by software that will check for unusual coincidences in answer patterns that may indicate cheating.

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 coordinator 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

https://academicssupport.uwo.ca/accessible_education/index.html