

Chem 2223B (Winter 2024–25)

Organic Chemistry of Biological Molecules

Course Description & Prerequisite Requirements

Calendar description: *An examination of the chemistry of naturally occurring molecules, emphasizing organic compounds of importance in the Biological and Health Sciences.*

Extra information: 3 lecture hours, 1.5 laboratory hours (3 h every other week), 0.5 course.

This course is fully in-person. All lectures, experiments, and assessments are in-person. Online alternatives are not available.

To ensure that a minimum level of preparation has been attained, Chem 2213A/B or 2283G is required as a prerequisite. Chem 2273A alone, in the absence of Chem 2283G, is inadequate preparation and therefore not a suitable prerequisite. This course does not have any antirequisites.

Unless you have either the prerequisites for this course or written special permission from your Dean to enroll in it, you may be removed from this course and it will be deleted from your record. This decision may not be appealed. You will receive no adjustment to your fees in the event that you are dropped from a course for failing to have the necessary prerequisites.

Students repeating the course must repeat the lab component. There are no exemptions.

Key Dates

Date	Event
Monday, January 20	First week of lab rotations. Your first lab may be this week or the following week. Please refer to the lab schedule.
Saturday, February 8, 1:30 – 3:30 PM	Test #1
Saturday, March 15, 1:30 – 3:30 PM	Test #2 (non-cumulative)
Monday, March 31 ("Drop deadline")	Last day to drop a fall-term course without academic penalty. If you drop the course on or before this date, it will be shown on your academic record as WDN (withdrawn). Dropping after this date will result in a WDF, which counts as an F.

Course Website

News, course updates, and relevant materials will be posted on Western's learning management system, OWL Brightspace (<http://owl.uwo.ca>). This is the primary method by which information will be disseminated to all students in the class, so you are responsible for checking OWL on a frequent basis.

If you need technical assistance with OWL, seek support on the OWL Help page. Alternatively, contact the Western Technology Services Helpdesk by phone at 519-661-3800 or extension 83800.

Learning Outcomes

Chem 2223B has an emphasis on the development of skills such as critical thinking, problem solving, and scientific reasoning; these transversal skills are essential to success in not just chemistry but also in other courses and in many occupations. A student receiving credit for Chem 2223B will be expected to reliably demonstrate competence in their ability to:

Discipline-Specific Expectations	Professional-Skill Expectations
Describe the importance of organic chemistry in everyday life and the interdisciplinary nature of organic chemistry.	Analyze and critically assess problems, and take a systematic approach to solve them.
Use critical thinking skills to explain, make connections between, and apply chemical principles, laws, and theories that pertain to the chemistry of living systems.	Work independently, as well as with others in an effective, practical, social, and ethical manner.
Evaluate and assess chemical data and information and explain how they relate to chemical theories/laws.	Obtain, evaluate, and integrate information from various sources, and determine its relevance.
Apply chemical theories or laws to solve a variety of novel chemical problems.	Prioritize tasks and manage the use of time.
Conduct experiments and draw conclusions from collected experimental data and results.	Execute mathematical calculations accurately.
Safely use a variety of laboratory equipment and instrumentation to perform experimental procedures and explain the underlying theory behind all of them.	Communicate thoughts, ideas, and observations verbally and in writing.
	Recognize when to seek assistance.
	Develop respect for, and comply with, regulations and policies.
	Accept responsibility for their decisions, actions, and inactions.

Class Topics

Topic	Approx # of Classes
Colours and Chromophores Photophysical processes, UV/visible absorption spectroscopy, fluorescence spectroscopy	3
Cellular Structure and Function (examinable self-study section) Brief overview of components, organelles, and function	0
Amino Acids and Proteins Acid-base properties, protein structure, composition and sequence analyses, Edman degradation, laboratory peptide synthesis, enzymes, biosynthesis of proteins	9
Carbohydrates Stereochemistry, reactions of functional groups, properties of di- and polysaccharides, mechanisms of glycolytic reactions, connection between pyruvate and amino acids	8
Lipids Properties, biosynthesis and beta-oxidation of fatty acids, synthesis of soaps and detergents, biosynthesis of terpenes, phospholipids, fat-soluble vitamins	7
Nucleic Acids Structure and properties, DNA sequencing, laboratory DNA synthesis, carcinogens	3
Pharmaceutical Drugs Sources of pharmaceutical drugs, approval process, sulfanilamide, PDT	3

Course Materials

Chemistry 2223B Lab Manual, Practice Problems, and Sample Tests & Exams (2024–25 edition)

- This edition is required. Second-hand or old editions cannot be used. Students repeating the course will require a new lab manual. Photocopies are not accepted. The lab manual must be purchased from the bookstore, and the cost of this item can be found at <https://bookstore.uwo.ca/product/9781533972316>.

No official textbook

- This course does not have an official textbook, but many students will find their Chem 2213A or 2283G textbook (*Organic Chemistry* by Klein, any edition) to be a useful reference.

Proper lab attire

- This includes an appropriate lab coat, safety glasses, shoes, socks, and pants. Please see the lab manual for further details.

Molecular model kit, by Darling Models

- Other model kits may be used, but we highly recommend this kit for its ease of use.

Course Personnel, Lecture Info, and Contact Info

Throughout the term, your course instructors, a lab coordinator, an undergraduate assistant, a counselling assistant, and many teaching assistants contribute to the course. They are here to support your learning and help you achieve your goals. Your instructor's information can be found below.

Lecture Section	Time (MWF)	Room	Instructor	Email
█	█	█	█	█

Email should only be used for administrative purposes. Emails are triaged during regular business hours and answered in the order of importance. To allow the Chem 2223B team to respond to administrative concerns as quickly as possible, please do not send emails containing:

- Questions about course material or on how to do a particular problem in the workbook. Such questions should be taken to the Resource Room or posted on the OWL forum.
- Questions that can be answered based on the information found in this course outline.
- Requests for grade increases, extra assignments, make-up labs, or similar.

If you email us, you **must use your Western email address and include *Chem 2223B* in the subject line**. Messages from a non-Western account or those that do not include *Chem 2223B* may be blocked by the university's anti-spam system. Including your student number would be useful.

Constructive feedback is valuable to us. Please do not hesitate to contact us if you have any comments or feedback on any aspect of Chem 2223B. We are always trying to improve the course so that we can improve your experience!

Learning Support and Resources

OWL Forums

The forums on OWL provide an engaging venue for students to collaboratively discuss course concepts. Course TAs will be participating in the discussions.

Chemistry Resource Room

The Chemistry Resource Room (both in-person and virtual) provides you with an informal environment for you to ask questions related to lecture material and obtain assistance on practice problems. Group work and peer-to-peer support are strongly encouraged.

Instructors' Student Hours

Course instructors have student hours (office hours) that can be scheduled by appointment. Each course instructor supports many students, so please note that these hours are set aside for concerns (e.g. learning strategies, personal matters, etc.) that cannot be addressed through the OWL forums or the Resource Room. That way, if you have such concerns, you can be assured that you will have someone to talk to!

Learning Development & Success

Learning-skills professionals at LDS (<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. LDS also runs a Peer Assisted Learning Centre.

Tutors

Private, third-party review or tutor services are not affiliated with, or endorsed by Western. As such, the university cannot be responsible for any of the content they provide, even if the content causes you to answer exam questions incorrectly. Because of liability reasons, your instructors are not permitted to suggest or recommend any specific tutors.

Students should realize that they may not hire tutors who are Chem 2223B teaching assistants, even if they are not from your own lab section. This is a serious legal matter pertaining to conflict of interest.



Accommodation, Accessibility, and Support Services

Students with disabilities are encouraged to contact Accessible Education (http://academicsupport.uwo.ca/accessible_education/index.html), which provides recommendations for accommodation based on medical documentation or psychological and cognitive testing. The university's policy on Accommodation for Students with Disabilities can be found here: https://www.uwo.ca/univsec/pdf/academic_policies/appeals/Academic%20Accommodation_disabilities.pdf

When conflicts with a religious holiday that requires an absence from the University or prohibits certain activities, students should request an accommodation for their absence in writing to the course instructor and/or the Academic Advising office of their Faculty of Registration. This notice should be made as early as possible but not later than two weeks prior to the writing or the examination (or one week prior to the writing of the test). Please visit the Diversity Calendars posted on our university's EDID website for the recognized religious holidays: <https://www.edi.uwo.ca>

Please visit the Science & Basic Medical Sciences Academic Advising webpage for information on adding/dropping courses, academic considerations for absences, appeals, 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://www.uwo.ca/health>) for a list of options about how to obtain help.

Western is committed to reducing incidents of gender-based and sexual violence and providing compassionate support to anyone who has gone through these traumatic events. If you have experienced sexual or gender-based violence (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.

Western University is committed to a thriving campus as we deliver our courses in the mixed model of both virtual and face-to-face formats. We encourage you to check out the Digital Student Experience website to manage your academics and well-being: <https://www.uwo.ca/se/digital>.

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

Academic Policies and Legalities

The use of generative artificial intelligence (AI) tools/software/apps is unacceptable in this course.

The website for Registrarial Services is <http://www.registrar.uwo.ca>.

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 e-mail address. It is the responsibility of the account holder to ensure that e-mail received from the University at his/her official university address is attended to in a timely manner.

It is university policy that a regularly scheduled class (lecture, lab, or tutorial) takes precedence over tests and exams. Therefore, if another course schedules a test or exam that takes place during your chemistry lecture or lab, the instructor for that course must accommodate you.

Aside from a non-programmable scientific calculator, no other electronic devices (phones, tablets, etc.) may be in your possession during tests and exams, even for timekeeping purposes. They may not be at your test/exam desk or in your pocket. Any student found in possession of these prohibited devices will receive a mark of zero on the test or exam.

Scholastic offences are taken seriously and students are directed to read the appropriate policy, specifically, the definition of what constitutes a Scholastic Offence, at this website: http://www.uwo.ca/univsec/pdf/academic_policies/appeals/scholastic_discipline_undergrad.pdf

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

Although the intent is for this course to be delivered in person, should any university-declared emergency require some or all of the course to be delivered online, either synchronously or asynchronously, the course will adapt accordingly. The grading scheme will not change. Any assessments affected will be conducted online as determined by the course instructor.

Tests and examinations in this course are in-person assessments. In the event that one or more of these assessments need to be conducted online due any university-declared emergency, they may be conducted using a remote proctoring service. By taking this course, you are consenting to the use of this software and acknowledge that you will be required to provide **personal information** (including some biometric data) and the session will be **recorded**. Completion of this course will require you to have a reliable internet connection and a device that meets the technical requirements for this service. More information about this remote proctoring service, including technical requirements, is available on Western's Remote Proctoring website at: <https://remoteproctoring.uwo.ca>.

Laboratory Information and Schedule

For each experiment, watch any provided technique videos that may be on OWL and complete the prelab quiz before the start of your scheduled laboratory session, which is determined by your section of registration. The videos and the prelab quiz will be released at least one week prior to your scheduled laboratory session. The prelab quizzes are worth 20% of each laboratory and cannot be taken until after the prelab videos have been viewed.

In-person labs are located in Chemistry Building 111 and 112. These rooms are on the first floor of the Chemistry Building. You must attend the section in which you are registered and be in your assigned room. Your room will be assigned when you arrive for your first experiment.

Experiment	Odd-Numbered Lab Sections	Even-Numbered Lab Sections
1. TLC Analysis	Week of January 20	Week of January 27
2. Amino Acids and Proteins	Week of February 3	Week of February 10
3. Carbohydrates	Week of February 24	Week of March 3
4. Fats, Oils, Soaps, and Detergents	Week of March 10	Week of March 17
5. Synthesis of Zyban	Week of March 24	Week of March 31

More information on labs will disseminated via OWL announcements.

Evaluation

Components

Your overall course grade out of 100 will automatically be the *higher* of the grades calculated by the two methods shown below using the respective component weights.

Component	Notes	Method 1	Method 2
Laboratory	Five experiments × 4.00 each	20	20
Test #1	Saturday, February 8, 1:30 – 3:30 PM	33	--
Test #2	Saturday, March 15, 1:30 – 3:30 PM	--	33
Final Exam	Scheduled by the Registrar, 3.00 hours	47	47

Requirements for Passing Chem 2223B

To obtain credit for the course, all three requirements below must be met:

1. Obtain a minimum of 50% on the overall course grade.
2. Obtain a minimum of 50% on the laboratory component (10.00 out of 20). This mark is calculated from all five experiments. A missed experiment is assigned a mark of zero unless it has been “excused” (see section on Missed Course Components).
3. Miss no more than two experiments, whether excused or not.

Students who fail to meet requirement #2 or #3 will receive a course grade no greater than 40% (even if the calculated course grade is higher) and will not receive credit for the course.

Equal Opportunity and Evaluation Policy

We are here to help you attain your goals. We want you to do well in the course. We were, at one time, students ourselves, so we understand the importance of course grades and the hard work that you will invest into this course.

Most importantly, we also have to be fair. The university is committed to academic integrity and has high ethical and moral standards. 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 or how hard the student tried. Claims of an excellent academic history, of attendance in the course components, or of personal issues (family, relationship, financial, etc.) cannot be used to justify a higher grade in the course because they are not criteria for evaluation. There is no extra work available for extra credit or to “make up” another grade. We do not offer any extra assignments, essays, experiments, or other work of any kind to any student.

The requirement for a higher grade in order to, for example, maintain a scholarship, enter a program, or obtain a higher GPA for various reasons, is not a justifiable reason for increasing your grade. If we increased or “bumped” your grade (*i.e.* gave you a grade that you did not legitimately earn), it would be unfair to the other students and also a great disservice to the scholarships and programs who are evaluating all students on the basis of their grades. Please do not ask us for a grade increase.

Late or Missed Coursework

We realize that occasionally, students may experience an extenuating circumstance of significant severity (such as illness or injury) that temporarily renders them unable to meet academic requirements.

Students must familiarize themselves with the *University Policy on Academic Consideration – Undergraduate Students in First Entry Programs* posted on the Academic Calendar at:
https://www.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 at:
http://academicsupport.uwo.ca/accessible_education/index.html

For procedures on how to submit academic consideration requests, please see the information posted on the Office of the Registrar’s website at:
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.

- If you are a Science or Basic Medical Sciences student, information on academic considerations (as well as adding/dropping courses, appeals, exam conflicts, and many other academic-related matters) can be found at: website: <https://www.uwo.ca/sci/counselling/>

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:

- Test #1 and Test #2, when a student misses *both* of them (more details provided below)
- Final Exam

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 built-in flexibility below, the request cannot be recalled and reapplied. This privilege is forfeited.

Because the following components already have built-in flexibility, academic consideration requests will be denied for:

- Test #1 or Test #2 (counting only the higher mark, on a percentage basis, of the two tests)

However, the course offers additional academic consideration: students who miss *both* Test #1 and Test #2 may provide documentation to request academic consideration, and when granted, the weight of the tests will be shifted to the Final Exam.

A summary of the procedures for the different course components is provided below.

Missed Lab Session

Step 1	There are no make-up labs, nor is it possible to reschedule a lab. Obtain academic consideration.
Anything else?	Nope! After obtaining academic consideration, please do not contact your instructor or lab coordinator even though you may be asked to do so. We will be automatically notified of the academic consideration.
What happens?	The missed lab will be “excused” and its weight will be distributed over all of the other labs. There are no online alternatives available. If academic consideration was not obtained, the missed lab will be given a mark of zero. Tests and exams will contain questions related to the theoretical aspects of the experiments. You are still responsible for the material pertaining to the missed labs.
Good to know!	Even with academic consideration, you must complete at least two experiments in order to be eligible to pass the course.

Missed Test #1 and/or Test #2

There are no make-up tests. The procedure depends on whether you miss one or both tests.

Missed one of Test #1 or Test #2

What happens? Only the best mark, on a percentage basis, from the two tests counts towards your course grade, so if you miss one of the two, the other test will be counted. Please do not request academic consideration for missing Test #1. No action is required.

Missed Both Test #1 and Test #2

- Step 1** Students who miss both tests will need to obtain academic consideration. **Supporting documentation that covers the date of Test #2, March 15, is required.**
- Anything else?** Nope! After obtaining academic consideration, please do not contact us even though you may be asked to do so. We will be automatically notified of the academic consideration after it has been processed.
- What happens?** The weight of the test will be transferred to the Final Exam.

Missed Final Exam

- Step 1** Obtain academic consideration. **Supporting documentation is required.**
- Anything else?** Nope! After obtaining academic consideration, please do not contact us even though you may be asked to do so. We will be automatically notified of the academic consideration after it has been processed.
- What happens?** You will be able to write the Special Exam (the name given to a make-up Final Exam) in May.
- If you miss the Special Exam, you will need to obtain academic consideration again. If it is granted, the date of the next Special Exam will normally be the scheduled date for the Final Exam the next time this course is offered. The maximum course load for the term in which the Special Exam is granted will be reduced accordingly. Please see the section on Special Exams in the Academic Calendar for details:
https://www.westerncalendar.uwo.ca/PolicyPages.cfm?Command=showCategory&PolicyCategoryID=5&SelectedCalendar=Live&ArchiveID=#Page_65
- Good to know!** You may also be able to write the Special Exam if you are in a “Multiple Exam Situation.”
- https://registrar.uwo.ca/academics/examinations/exam_conflicts.html

This course is supported by the Science Student Donation Fund. If you are a BSc or BMSc student registered in the Faculty of Science or Schulich School of Medicine and Dentistry, you pay the Science Student Donation Fee. This fee contributes to the Science Student Donation Fund, which is administered by the Science Students' Council (SSC). One or more grants from the Fund have allowed for the purchase of equipment integral to teaching this course. You may opt out of the Fee by the end of September of each academic year by completing paperwork in the Faculty of Science's Academic Advising office. For further information on the process of awarding grants from the Fund or how these grants have benefitted undergraduate education in this course, consult the chair of the department or email the Science Students' Council at ssc@uwo.ca.