



Chemistry

UNIVERSITY OF TORONTO

CHM 479H/1008: Biological Chemistry

2022 Winter Course Syllabus

I TEACHING TEAM

INSTRUCTOR

Professor Mark Nitz

Mark.nitz@utoronto.ca

Lash Miller Laboratories Room 439

Online student hours – One hour after class on Thursdays or by appointment

II COURSE OVERVIEW

COURSE DESCRIPTION:

This course covers in-depth examination of bacterial peptidoglycan biosynthesis, how the mechanisms of the enzymes involved were determined and how these enzymes have been targeted for antibiotic discovery.

STUDENT LEARNING OUTCOMES:

At the end of the course, you will be able to apply chemical knowledge to understand, evaluate and speculate on how small molecules may interact with and effect biochemical pathways and enzyme systems. Using your interpretation of biochemical assay results you will be able to propose hypothesis concerning the mechanisms of the enzymes involved and how they relate to the overall biochemical pathway.

PREREQUISITE COURSE(S):

This course assumes you have a basic understanding of chemical reactivity and functional groups at the level of CHM347, biochemistry at the level of BCH210, and fundamentals of reaction and enzyme kinetics.

Prerequisites: BCH210H, CHM347, CHM348.

This course is a prerequisite for the following course(s)...

READINGS:

Reference text: D. Voet and J. G. Voet, "Biochemistry".

Journal articles will also be cited in lecture notes and you may find these useful to understand the course content.

III COURSE ORGANIZATION

This course will proceed in an online only format until the time that the in person classes are again allowed.

Class Location and Time:

- Pre-recorded lectures posted on Quercus

- Discussions of class material will happen on Tuesday and Thursday at 11 am EST synchronously on Zoom. Zoom link for synchronous discussion will be posted in Quercus announcements. Until further notice

COURSE SCHEDULE & RELEVANT SESSIONAL DATES:

DATES	Discussion number	TOPICS
Jan 11	Intro	Course intro and the Penicillin story, Discovery and isolation
Jan 13	Discussion 1	MurA (Part I and Part II)
Jan 18	Discussion 2	MurB
Jan 20	Discussion 3	MurC-F (Part I and Part II)
Jan 25	Discussion 4	MurC-F (Part III)
Jan 27	Discussion 5	MraY Part I
Feb 1	Discussion 6	MurG Part I
Feb 3	Discussion 7	MurG Part II
Feb 8	Discussion 8	Flippase Part I (Assignment 1 Due)
Feb 10	Discussion 9	Flippase Part II
Feb 15	Discussion 10	Polymerizing the glycan
Feb 17	Discussion 11	Crosslinking the peptide Part I and Part II
Feb 22		Reading week
Feb 24		Reading week
March 1		Midterm!
March 3	Discussion 12	Mechanism of Penicillin
March 8	Discussion 13	Penicillin resistance lactamases and metallolactamases
March 10	Discussion 14	Penicillin resistance clavulanic acid and related compounds (Assignment 2 Due)
March 15	Discussion 15	metallolactamase inhibitors
March 17	Discussion 16	Vancomycin
March 22	Discussion 17	Vancomycin Resistance and other supramolecules
March 24	Discussion 18	Non-ribosomal Peptide synthesis 1 and 2
March 29	Discussion 19	Non-ribosomal Peptide synthases 3
March 31	Discussion 20	Graduate student presentations
April 5	Discussion 21	Graduate student presentations
April 7	Discussion 22	Graduate student presentations

IV EVALUATION/GRADING SCHEME

OVERVIEW:

CHM479

Discussion Participation 15%
Assignments (x2): 30%
Midterm exam: 20%*
Final Assessment: 35%*

CHM1008

Discussion Participation 10%
Assignments (x2): 25%
Midterm exam: 20%
Class Presentation 15%
Final Assessment: 30%

*If the final assessment grade is better than the midterm grade the weighting of the midterm will be reduced to 15% and the final assessment increased to 40%

Discussion Participation

A written question about the discussion material is submitted via Quercus, (Due midnight before the synchronous discussion). These questions will be taken up in the synchronous session and you may be asked for clarification on your submitted question. The grading of the questions will be taken up in course introduction discussion. The first questions are due on Jan 12th. Late discussion questions will not be accepted. The best 15 discussion question grades out of the 22 possible submissions will count towards your final grade. The 15 out of 22 approach is done to provide adequate accommodation for absences

Questions are submitted via Quercus.

Assignments

These assignments will be based on literature related to the enzymes and topics we cover in the course. Assignments are to be completed individually. Assignments are to be submitted via Quercus.

Assignment 1 Due Feb 8th

Assignment 2 Due March. 10th

Exams

Midterm Exam (March 1st). This will cover material up to Discussion 10. Depending on the ability to meet in person, the exam format will be either take home or in class. This will be discussed in during Discussion 10. Practice midterm questions will be available on Quercus. A synchronous debrief after the exam will occur after Discussion 12 in the student hour.

Final Exam: This will occur during the exam period. The final exam is cumulative. The format of the exam will depend on the ability to meet in person and will be taken up during discussion 19.

In class presentation (CHM1008 only). (Due March 31st)

You will be assigned a topic for a 20 minute presentation. We will discuss the content of the presentation as a group. You will answer the submitted questions on during the discussion section. Please email the link to the presentation recording to Prof. Nitz prior to midnight March 31st.

For students missing the midterm test for a valid reason, the missed grade will be calculated based on performance on the final exam.

IMPORTANT: if an unexpected technical issue occurs with a university system (e.g., Quercus services, network outage) that affects availability or functionality, it may be necessary to revise the timing or weighting of the discussions or midterm exam.

V COURSE POLICIES

- Each member of this course is expected to maintain a:
 - (i) professional and respectful attitude during all course activities, including discussions and all online activity.
 - (ii) personal calendar/schedule/organizer to ensure that all course activities are completed, and due dates are met.
 - (iii) familiarity with the university policy on Academic Integrity (overleaf)
- The University of Toronto is committed to equity, human rights and respect for diversity. All members of the learning environment in this course should strive to create an atmosphere of mutual respect where all members of our community can express themselves, engage with each other, and respect one another's differences. As a Course Instructor, I will neither condone nor tolerate behaviour that undermines the dignity or self-esteem of any individual in this course and wish to be alerted to any attempt to create an intimidating or hostile environment. It is our collective responsibility to create a space that is inclusive and welcomes discussion. Discrimination, harassment and hate speech will not be tolerated. If you have any questions, comments, or concerns, we encourage you to reach out to the staff in our Equity Offices.
- Communication with instructor (e.g., I will respond to email within 24 hrs. on weekdays).
- This course, including your participation, will be recorded on video and will be available to students in the course for viewing remotely and after each session.
- Course videos and materials belong to your instructor, the University, and/or other sources depending on the specific facts of each situation, and are protected by copyright. Do not download, copy, or share any course or student materials or videos without the explicit permission of the instructor.
- Policy for late assignment submissions (e.g., 5% will be deducted daily).
- All assignments and discussion questions should be submitted via Quercus.
- Please email Prof. Nitz in cases of extended absences for valid medical reasons to discuss potential accommodations.

VI TECHNOLOGY REQUIREMENTS

- Specific guidance from the U of T Vice-Provost, Students regarding student technology requirements is available here:
<https://www.viceprovoststudents.utoronto.ca/covid-19/tech-requirements-online-learning/>
- Advice for students more broadly regarding online learning is available here:
<https://onlinelearning.utoronto.ca/getting-ready-for-online/>
- This course requires the use of computers, and technical issues are possible. When working on a piece of academic work, students are responsible for scheduling enough time to allow for reasonable delays due to technical difficulties to be overcome, so such issues will not be acceptable grounds for deadline extension. Particularly, maintaining an up-to-date independent backup copy of your work is strongly recommended to guard against hard-drive failures, corrupted files, lost computers, etc.

VII INSTITUTIONAL POLICIES & SUPPORT

ACADEMIC INTEGRITY

Academic integrity is essential to the pursuit of learning and scholarship in a university, and to ensuring that a degree from the University of Toronto is a strong signal of each student's individual academic achievement. As a result, the University treats cases of cheating and plagiarism very seriously. The University of Toronto's Code of Behaviour on Academic Matters

(governingcouncil.utoronto.ca/secretariat/policies/code-behaviour-academic-matters-july-1-2019) outlines the behaviours that constitute academic dishonesty and the processes for addressing academic offences. Potential offences include, but are not limited to:

In take home assignments :

1. Using someone else's ideas or words without appropriate acknowledgement.
2. Submitting your own work in more than one course without the permission of the instructor.
3. Making up sources or facts.
4. Obtaining or providing unauthorized assistance on any assignment. **Please note that the use of websites (such as Chegg.com or the course discussion board) to assignment material/questions or to post/access answers to questions is an academic offence under the University of Toronto's Code of Behaviour on Academic Matters. Alleged instances of this nature are forwarded to the Faculty of Arts & Science Student Academic Integrity office.**

On quizzes and term tests:

1. Using or possessing unauthorized aids. **Please note that the use of websites (such as Chegg.com or the course discussion board) to post quiz/term test questions or to post/access answers to questions is an academic offence under the University of Toronto's Code of Behaviour**

on Academic Matters. Alleged instances of this nature are forwarded to the Faculty of Arts & Science Student Academic Integrity office.

2. Looking at someone else's answers or collaborating/discussing answers during a quiz or term test.
3. Misrepresenting your identity.

In general academic work:

1. Falsifying institutional documents or grades.
2. Falsifying or altering any documentation required by the University.

All suspected cases of academic dishonesty will be investigated following procedures outlined in the Code of Behaviour on Academic Matters. If you have questions or concerns about what constitutes appropriate academic behaviour or appropriate research and citation methods, you are expected to seek out additional information on academic integrity from your instructor or from other institutional resources (see www.academicintegrity.utoronto.ca/).

COPYRIGHT

If a student wishes to copy or reproduce class presentations, course notes or other similar materials provided by instructors, he or she must obtain the instructor's written consent beforehand. Otherwise, all such reproduction is an infringement of copyright and is absolutely prohibited. More information regarding this is available here: <https://teaching.utoronto.ca/ed-tech/audio-video/copyright-considerations/>

ACCESSIBILITY NEEDS

Students with diverse learning styles and needs are welcome in this course. The University of Toronto is committed to accessibility: if you require accommodations for a disability, or have any other accessibility concerns about the course, please contact [Accessibility Services](#) as soon as possible.

ACCOMMODATIONS FOR RELIGIOUS OBSERVANCES

Following the University's policies, reasonable accommodations will be made for students who observe religious holy days that coincide with the due date/time of an assignment, tutorial, class or laboratory session. Students must inform the instructor **before** the session/assignment date to arrange accommodations.

ADDITIONAL SERVICES & SUPPORT

The following are some important links to help you with academic and/or technical service and support:

- General student services and resources at [Student Life](#)
- Full library service through [University of Toronto Libraries](#)
- Resources on conducting online research through [University Libraries Research](#)
- Resources on academic support from the [Academic Success Centre](#)
- Learner support at the [Writing Centre](#)
- Information for [Technical Support/Quercus Support](#)

ACKNOWLEDGEMENT OF TRADITIONAL LANDS

We wish to acknowledge this land on which the University of Toronto operates. For thousands of years, it has been the traditional land of the Huron-Wendat, the Seneca and, most recently, the Mississaugas of the Credit River. Today, this meeting place is still the home to many Indigenous people from across Turtle Island and we are grateful to have the opportunity to work on this land.