

We recognize and acknowledge that McMaster University meets and learns on the traditional territories of the Mississauga and Haudenosaunee nations, and within the lands protected by the "[Dish with One Spoon](#)" wampum, an agreement amongst all allied Nations to peaceably share and care for the resources around the Great Lakes.

BIOCHEM 4N03 – Molecular Membrane Biology 2023 Winter Term

Instructor: Dr. Russell E. Bishop | **E-mail:** bishopr@mcmaster.ca | **Office:** HSC-4H31B

Office Hours : By email appointment

Teaching Assistant: Md Salman Reza | **E-mail:** rezam9@mcmaster.ca | **Office:** Virtual

Course Schedule

- **Lectures:** Tues, Wed, Fri 9:30AM - 10:20AM **Room:** KTH B104

Course Description

This course will provide an overview of the structure, organization and properties of biological membranes and how these relate to the various functions of membranes.

Prerequisite(s): Credit or registration in BIOCHEM 3D03; or BIOCHEM 2EE3 and BIOCHEM 3G03; or one of HTHSCI 2D06 A/B, HTHSCI 2E03, ISCI 2A18 A/B

Antirequisite(s): BIOCHEM 4K03

Course Learning Outcomes

By the end of this course, students will be able to investigate the properties and structures of membranes by examining their molecular components and providing molecular mechanisms to explain structure-function relationships. Students will be able to scrutinize biological membrane proteins and their interactions with membrane lipids in terms of the chemiosmotic theory. Strategies for signal transduction cascades, hormones, receptors, enzymes, transporters, and channels will be comprehended in molecular terms. Experiments using spectroscopy and kinetics will test formal hypotheses pertinent to membrane biology.

Materials & Fees

Textbook: Membrane Structural Biology with Biochemical and Biophysical Foundations, Second Edition, by Mary Luckey, Cambridge University Press, 2014.

Virtual Course Delivery – TEAMS if necessary

Course Overview and Assessment

Schedule

DATE	TOPIC	<i>Pages from Luckey</i>
Tuesday, January 10	Introduction	
Wednesday January 11	General features of membranes	1-13
Friday January 13	Membrane Lipids – chemical structure	14-22
Tuesday January 17	Membrane Bilayer and lipid motions	22-27
Wednesday January 18	Membrane asymmetry; Lipid polymorphism and membrane curvature	27-31
Friday January 20	Miscibility of bilayer lipids	31-34
Tuesday January 24	Domains – rafts and caveolae	34-37
Wednesday January 25	Diversity of Lipids	37-41
Friday January 27	Tools of Studying Membranes: Detergents	42-51
Tuesday January 31	Model membranes	51-67
Wednesday February 1	Helical Bundles	105-115
Friday February 3	Beta Barrels	115-129
Tuesday February 7	Protein folding and biogenesis	168-202
Wednesday February 8	Circular dichroism	TBA
Friday February 10	Circular dichroism	TBA
Tuesday February 14	Interfacial Enzyme Kinetics	TBA
Wednesday February 15	Interfacial Enzyme Kinetics	TBA
Friday February 17	Quiz #1	
Mid Term Recess February 20 to 24		
Tuesday February 28	Quiz #1 Returned	
Wednesday March 1	Membrane enzymes	226-256
Friday March 3	Membrane enzymes	226-256
Tuesday March 7	Membrane Receptors	257-283
Wednesday March 8	Membrane Receptors	257-283

Friday March 10	Transporters	284-327
Tuesday March 14	Transporters	284-327
Wednesday March 15	Channels	328-357
Friday March 17	Channels	328-357
Tuesday March 21	Energy transduction overview	358-384
Wednesday March 22	NADH dehydrogenase	358-365
Friday March 24	Cytochrome bc1	365-371
Tuesday March 28	Cytochrome c oxidase	371-375
Wednesday March 29	ATP synthase	375-384
Friday March 31	Bioenergetics	TBA
Tuesday April 4	Respiratory supercomplexes	TBA
Wednesday April 5	Quiz #2 (Test ban starts April 6)	
Friday April 7	Good Friday	No class
Tuesday April 11	Photosystem II	TBA
Wednesday April 12	Photosystem I	TBA

Evaluation

Assessment Overview

Grade Item	Due Date	Weight (%)
Quiz 1	Fri Feb 17 During Class	30
Quiz 2	Wed April 5 During Class	30
Final Exam (Cumulative)	TBA (last weeks of April)	40

Attendance

Please be advised that it is important for students to attend the lectures. If you cannot attend a lecture it is important that you obtain notes from another student to find out what material was covered in class. Although the textbook covers most of the material covered in class, not all material in the class will be covered in the textbook and not all material in the textbook will be presented in class. **YOU WILL ONLY BE TESTED ON MATERIAL COVERED IN THE LECTURES.** Therefore, plan to attend as many classes as possible

so you can know what material to study in the textbook, and what material to study from various handouts and reading assignments.

Notetaking

Please bring a pen or pencil and a paper notebook to classes so you can take notes that are drawn on the board. You will be asked to reproduce some of these notes on the quizzes and final exam.

Policies and Procedures

Requests for Relief for Missed Academic Term Work

[McMaster Student Absence Form \(MSAF\)](#): In the event of an absence for medical or other reasons, students should review and follow the Academic Regulation in the Undergraduate Calendar “Requests for Relief for Missed Academic Term Work”.

Academic Accommodation of Students with Disabilities

Students with disabilities who require academic accommodation must contact [Student Accessibility Services \(SAS\)](#) at 905-525-9140 ext. 28652 or sas@mcmaster.ca to make arrangements with a Program Coordinator. For further information, consult McMaster University’s [Academic Accommodation of Students with Disabilities](#) policy.

Academic Accommodation for Religious, Indigenous Or Spiritual Observances (Riso)

Students requiring academic accommodation based on religious, indigenous or spiritual observances should follow the procedures set out in the [RISO](#) policy. Students should submit their request to their Faculty Office **normally within 10 working days** of the beginning of term in which they anticipate a need for accommodation or to the Registrar's Office prior to their examinations. Students should also contact their instructors as soon as possible to make alternative arrangements for classes, assignments, and tests.

Courses with An On-Line Element

Some courses may use on-line elements (e.g. e-mail, Avenue to Learn (A2L), LearnLink, web pages, capa, Moodle, ThinkingCap, etc.). Students should be aware that, when they access the electronic components of a course using these elements, private information such as first and last names, user names for the McMaster e-mail accounts, and program affiliation may become apparent to all other students in the same course. The available information is dependent on the technology used. Continuation in a course that uses

on-line elements will be deemed consent to this disclosure. If you have any questions or concerns about such disclosure, please discuss this with the course instructor.

Online Proctoring

Some courses may use online proctoring software for tests and exams. This software may require students to turn on their video camera, present identification, monitor and record their computer activities, and/or lock/restrict their browser or other applications/software during tests or exams. This software may be required to be installed before the test/exam begins.

Academic Integrity

You are expected to exhibit honesty and use ethical behaviour in all aspects of the learning process. Academic credentials you earn are rooted in principles of honesty and academic integrity.

It is your responsibility to understand what constitutes academic dishonesty.

Academic dishonesty is to knowingly act or fail to act in a way that results or could result in unearned academic credit or advantage. This behaviour can result in serious consequences, e.g. the grade of zero on an assignment, loss of credit with a notation on the transcript (notation reads: “Grade of F assigned for academic dishonesty”), and/or suspension or expulsion from the university. For information on the various types of academic dishonesty please refer to the [Academic Integrity Policy](https://secretariat.mcmaster.ca/university-policies-procedures-guidelines/), located at <https://secretariat.mcmaster.ca/university-policies-procedures-guidelines/>

The following illustrates only three forms of academic dishonesty:

- plagiarism, e.g. the submission of work that is not one’s own or for which other credit has been obtained.
- improper collaboration in group work.
- copying or using unauthorized aids in tests and examinations.

Authenticity / Plagiarism Detection

Some courses may use a web-based service (Turnitin.com) to reveal authenticity and ownership of student submitted work. For courses using such software, students will be expected to submit their work electronically either directly to Turnitin.com or via an online learning platform (e.g. A2L, etc.) using plagiarism detection (a service supported by Turnitin.com) so it can be checked for academic dishonesty.

Students who do not wish their work to be submitted through the plagiarism detection software must inform the Instructor before the assignment is due. No penalty will be assigned to a student who does not submit work to the plagiarism detection software. **All submitted work is subject to normal verification that standards of academic integrity have been upheld** (e.g., on-line search, other software, etc.). For more details about McMaster's use of Turnitin.com please go to the [McMaster Office of Academic Integrity's](#) webpage.

Conduct Expectations

As a McMaster student, you have the right to experience, and the responsibility to demonstrate, respectful and dignified interactions within all our living, learning and working communities. These expectations are described in the [Code of Student Rights & Responsibilities \(the "Code"\)](#). All students share the responsibility of maintaining a positive environment for the academic and personal growth of all McMaster community members, **whether in person or online**.

It is essential that students be mindful of their interactions online, as the Code remains in effect in virtual learning environments. The Code applies to any interactions that adversely affect, disrupt, or interfere with reasonable participation in University activities. Student disruptions or behaviours that interfere with university functions on online platforms (e.g. use of Avenue 2 Learn, WebEx or Zoom for delivery), will be taken very seriously and will be investigated. Outcomes may include restriction or removal of the involved students' access to these platforms.

Copyright and Recording

Students are advised that lectures, demonstrations, performances, and any other course material provided by an instructor include copyright protected works. The Copyright Act and copyright law protect every original literary, dramatic, musical and artistic work, **including lectures** by University instructors.

The recording of lectures, tutorials, or other methods of instruction may occur during a course. Recording may be done by either the instructor for the purpose of authorized distribution, or by a student for the purpose of personal study. Students should be aware that their voice and/or image may be recorded by others during the class. Please speak with the instructor if this is a concern for you.

Research Ethics – N/A

Extreme Circumstances

The University reserves the right to change the dates and deadlines for any or all courses in extreme circumstances (e.g., severe weather, labour disruptions, etc.). Changes will be communicated through regular McMaster communication channels, such as McMaster Daily News, A2L and/or McMaster email.