ANAT/BIOC 458 – MEMBRANES AND CELLULAR SIGNALING

TIMETABLE - WINTER 2023

Instructors:
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Teaching Assistant: Lili Abuloghod, Goodman Cancer Research Centre, 1160 Pine Ave W., Room 507, lama.abuloghod@mail.mcgill.ca

Day, Time & Location: M / W / F; 08:35 PM – 09:25 PM; McIntyre Medical Building, Room 1034.

Date			Lecture Title	Lecture	Instructor
Jan.	04	W	Intro, Membrane Structure and Components	01	MD
	06	F	Lipids and Protein Topology	02	MD
	09	M	Analysis of Membrane Components	03	MD
	11	W	Analysis of Membrane Components	04	MD
	13	F	Analysis of Membrane Components	05	MD
	16	M	Model Membranes: Membrane Solubilization and Reconstitution	06	MD
	18	W	Membrane Trafficking Mechanisms: Endocytosis	07	MD
	20	F	Membrane Trafficking Mechanisms: Endocytosis	08	MD
	23	**M**	Trafficking and Cholesterol Homeostasis **1st Quiz (10%) Monday 6:30 - 7:30 PM (Lectures 1 – 8), Room TBD**	09	MD
	25	W	Fundamentals of Membrane Transport	10	MD
	27	F	Membrane Dynamics and Function	11	MD
	30	M	Carriers and Channels	12	MD
Feb.	01	W	Carriers and Channels – **Deadline to submit topic for the Oral Presentation**	13	MD
	03	F	Signaling Complexes in the Dendritic Spine	14	MD
	06	M	Signaling Complexes in the Dendritic Spine	15	MD
	08	W	**Pre-midterm Tutorial – Deadline to complete Independent-learning activities**	16	MD/**T.A.**
	10	**F**	**2nd Quiz (18%) Monday 11:35 AM - 12:25 PM, McMed 1034 (Lectures 1- 16)**	no class	
	13	M	Background Lecture – Molecular-Biological Methods	17	NLV
	15	W	Heterotrimeric G-protein Signaling	18	DR
	17	F	Heterotrimeric G-protein Signaling - **Deadline to submit questions for Orals**	19	DR
	20	M	Heterotrimeric G-protein Signaling	20	DR
	22	W	PI Signaling	21	CA
	24	F	PI Signaling	22	CA
	27 - 3		*FEB. 27th - MARCH 3rd, 2023 – STUDY BREAK*	no class	
Mar.	06	M	PI Signaling	23	CA
	08	W	PI Signaling	24	CA
	10	F	Tyrosine Kinases and Small G-protein Signaling	25	NLV
	13	M	Tyrosine Kinases and Small G-protein Signaling	26	NLV
	15	W	Tyrosine Kinases and Small G-protein Signaling	27	NLV
	17	F	Tyrosine Kinases and Small G-protein Signaling	28	NLV
	20	M	Cell-Matrix Interactions and Signaling	29	DR
	22	W	Cell-Matrix Interactions and Signaling	30	DR
	24	F	Prepare oral/video presentations	no class	MD/**T.A.**
	27	M	**Oral/video presentations**	31	MD
	29	W	**Oral/video presentations**	32	MD
	31	F	**Oral/video presentations**	33	DR
Apr.	3	M	**Oral/video presentations**	34	NLV
	5	W	**Oral/video presentations**	35	CA
	7	F	No class	no class	
	12	W	Pre-final Tutorial	36	NLV/CA/DR
	13-30	TBD	**FINAL EXAM (32%) Apr 13th-30th (Final exam covers lectures 17-30, 36)**		

Pre-requisites

BIOC 212, ANAT 262; one of PHGY 201, PHGY 209 or BIOL 205; one of BIOC 312 or ANAT 365; and BIOC 311 or permission of instructors. **RESTRICTIONS**: Students with credit for BIOC 458 may not take ANAT 458, and vice versa.

Course Description

The course presents an integrated treatment of the properties of biological membranes and of intracellular signaling, including the major role that membranes play in transducing and integrating cellular regulatory signals. Biological membrane organization and dynamics: membrane transport; membrane receptors and their associated effectors; mechanisms of regulation of cell growth, morphology, differentiation and death.

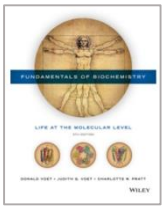
Learning Outcomes

- **Theoretical Content –** Biophysics and analysis of membrane components; membrane-membrane interactions; channels and carriers; extracellular matrix; Small G-proteins and intracellular trafficking; signaling via GPCR and phosphatidylinositol.
- **Critical Thinking** - Solve problems related to membranes and signaling
- **Independent Learning** - Independently understand concepts related to course material, but not explained in class.
- **Communication** - Communicate science to peers
- **Team Working** - Work with peers from in an interdisciplinary environment

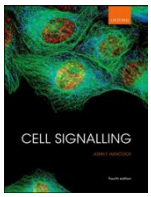
Recommended (not mandatory) Textbook

Older versions are acceptable surrogates.
Textbooks are available through McGill's *Le James Bookstore*

LIBRAIRIE / BOOKSTORE LE JAMES McGill



Voet D., Voet J. and Pratt S. (2016)
Fundamentals of Biochemistry, 5th Ed.,
digital or print (ISBN 978-1-118-91846-3)



Hancock J. T. (2016)
Cell Signalling, 4th Ed.,
digital or print (ISBN 978-0-19-252958-9)

Instructional Methods in this Course

- Interactive lectures. Include theoretical content, in-class exercise and problem-based learning.
- The instructional approach is based on student **attendance** and **active participation to exercises**.

TurningPoint

- **Polling:** Students are invited to install the Turning Point Cloud polling application (https://www.mcgill.ca/polling/) on their mobile device ahead of classes.

Evaluation Scheme

- **6 % Participation to in-class problem solving** (lectures #1-15)
- **6 % Independent-learning exercises** (MyCourses, average of 4 attempts/exercise, 45 min/attempt)
- **10 % Quiz #1*** (*lectures # 1-8*), Lockdown browser, 45 min (+ 5 min grace)
- **18 % Quiz #2*** (*covers lectures #1-16*), Lockdown browser, 45 min (+ 5 min grace)
- **20 % Oral** (or video) presentation
- **8 % Mini-quizzes** on oral/video presentations (online, via MyCourses), 15 min (+ 5 min grace)
- **32 % Final exam*** (*covers lectures #16-38 inclusive*), 3 h, in-person.

* OSD students will get accommodated upon signing up with OSD a minimum of 14 days prior to the start of an assessment. OSD students must sign up here: https://www.mcgill.ca/osd/student-resources/forms/exam-sign. OSD determines the type of accommodation.

- Assessments held during the regular semester time are managed by Course Coordinators, while those held during the Finals are managed centrally by Exam Center. Hence students must send their accommodation requests to the right authority.
- A deferred quiz or exam is worth the same as the regular quiz or exam. The supplemental is worth 100%.
- *Unless explicitly mentioned otherwise by the Instructor, Quizzes and Final exams are **INDIVIDUAL** assessments. Hence, seeking help from a friend is cheating, as stated in the Code of Student Conduct (Article 17).*
- *Assessments may be subjected to text-matching in accordance with the Policy on Text-Matching Software. Suspected plagiarism will be systematically reported to the Disciplinary Officer of the Faculty of Science.*
- **Language**

  Les étudiants peuvent soumettre en anglais ou en français tout travail écrit destiné à l'évaluation.

  In accord with McGill University's Charter of Students' Rights, students have the right to submit in English or in French any written work that is to be graded (except in courses where knowledge of a language is one of the objectives of the course).
- *In the event of extraordinary circumstances beyond the University's control, the content and/or evaluation scheme in this course is subject to change.*

Medical Notes

If you miss writing a quiz, you MUST BRING a doctors' note to the main office, room 905, McIntyre Building within 1 WEEK of the assessment date. In this case, a make up quiz will be scheduled. If a legitimate doctor's note is not provided, you will receive zero on the quiz. Students unable to write the Final must contact the Exam Center and register for a deferred Final (https://www.mcgill.ca/exams/dates/supdefer).

Grading:

*The department will **NOT** revise/upgrade marks except on sound academic grounds*. Once computed, the marks in this course will **NOT** be altered/increased. Decimal points will be "rounded of" as follows: if the final aggregate mark is computed to be 79.5%, the mark will be reported as 80% (an A-); a final aggregate mark of 79.4% will be reported as 79% (a B+). These marks are **FINAL and NON-NEGOTIABLE.***

*** Re-read Requests**

In addition to the abovementioned policy to NOT revise/upgrade marks, ***the Coordinator may impose a 1% penalty on any marking challenge that is not based on sound academic grounds***.

Examples: Should the re-read 1) be in favor of the student, the student gets the disputed marks back.
2) NOT be in favor of the student, a 1% penalty is imposed on the total course grade.

- Requests for re-read:
  - Quizzes: must be received by Coordinator BEFORE Final Exams begin. Any request past that date will be declined.
  - Final Exams: https://www.mcgill.ca/student-records/reread

Oral presentations

1. In teams of 3-4 students (team size varies upon enrollment), choose a topic among:

M. Denis	Aquaporin 4, Caveolin1, ABCA1, S1P (SKI-1), ARH, Perilipin-1, SR-B1 in Covid, Hepatitis C, SARS-CoV2 Spike Protein, Hyaluronidase-2, S2P in Aβ conversion, SERT, "Oncosomes"
N. Lamarche-Vane	Insulin receptor, EGFR, RhoA, p190RhoGAP, DOCK180, GSK-3, ERK1/2, Smad4, TGFβ, DLL4, WASP
D. Reinhardt	Cannabinoid receptor, μ-opioid receptors, Integrin β1, Integrin β4, laminin 332, collagen VII, Focal adhesion kinase, dystroglycan, DDR receptor, CD44.
C. Autexier	phospholipase C (PLC)-gamma 1, atypical protein kinase C (PKC) zeta and/or iota, Class III PI3K Vps34p, SH2 domain-containing inositol phosphatase(SHIP) 1 and/or 2, scaffold protein Par6

2. Get your choice approved by the instructor before **February 02.**
3. Prepare a 15-minutes oral (or video) presentation that covers:
   - Structure and physiological function(s) of the normal protein
   - Disease(s) associated with the protein
   - Propose one experimental approach to study its function in vitro

   ⇒ (i.e. application of concepts and techniques learnt in class)
   - Future directions
4. Present your work in front of class – Answer questions (5 min)

Useful resources

- **Student Rights and Responsibilities**
https://www.mcgill.ca/students/srr/academicrights

McGill University values academic integrity. Therefore, all students must understand the meaning and consequences of cheating, plagiarism and other academic offences under the Code of Student Conduct and Disciplinary Procedures (see http://www.mcgill.ca/students/srr/honest/ for more information).

- **McGill Academic Calendar** (add/drop, withdrawal and other deadlines)
https://www.mcgill.ca/study/2021-2022/important-dates

- **Time management**
https://www.mcgill.ca/tutoring/channels/event/time-management-your-best-ally-323895

https://www.mcgill.ca/osd/student-resources/learningresources/time-management

- **Stress management**
https://www.mcgill.ca/osd/student-resources/learningresources/stress-management

- **Office for Students with Disabilities (OSD)**
https://www.mcgill.ca/osd/

- **Health and Wellness Resources at McGill**

Student well-being is a priority for the University. All of our health and wellness resources have been integrated into a single Student Wellness Hub, your one-stop shop for everything related to your physical and mental health. If you need to access services or get more information, visit the Virtual Hub at www.mcgill.ca/wellness-hub or drop by the Brown Student Services Building (downtown) or Centennial Centre (Macdonald Campus). Within your faculty, you can also connect with your Local Wellness Advisor (to make an appointment, visit https://mcgill.ca/lwa).