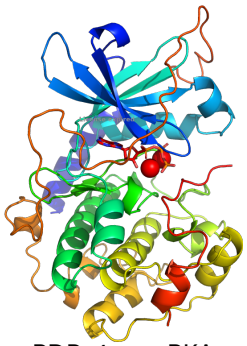
BIOC 2300 - Introduction to Biochemistry
Winter 2026

Dalhousie University operates in the unceded territories of the Mi'kmaw, Wolastoqey, and Peskotomuhkati Peoples. These sovereign nations hold inherent rights as the original peoples of these lands, and we each carry collective obligations under the Peace and Friendship Treaties.



PDB: 1atp - PKA

Section 35 of the Constitution Act, 1982 recognizes and affirms Aboriginal and Treaty rights in Canada.

We recognize that African Nova Scotians are a distinct people whose histories, legacies and contributions have enriched that part of Mi'kma'ki known as Nova Scotia for over 400 years.

Instructional Team Information:

Instructional Team:	Course Contact:	Office:
Dr. Shawn Xiong (coordinator)	BIOC2300@dal.ca	Tupper 8-J03
Maegan Burke (TA)		Tupper 8-J01
Sofia Mereshuk (TA)		Tupper 8-J01
Yang-yang Zuo (TA)		Tupper 8-J01

Meeting Information:

Time:	M/W/F 10:35 AM – 11:25 AM
Location:	KENNETH C ROWE MANAGEMENT 1028
Format:	Lecture + Weekly Flipped Practice Session

Course Description:

BIOC 2300 (CREDIT HOURS: 3). This course surveys basic topics and concepts of Biochemistry. The structures, properties and metabolic inter-relations of proteins, carbohydrates and lipids are considered together with an introduction to nutrition and metabolic control. Although mammalian examples predominate, some consideration of special aspects of biochemistry of microbes and plants is included.

Course Prerequisites:

BIOL 1010.03 (or equivalent), CHEM 1011.03 and 1012.03 (or equivalent), all with grades of C or higher, or instructor's consent. Students are advised to also take CHEM 2401.03 and CHEM 2402.03.
EXCLUSIONS: BIOC 2200.03

Course Objectives / Learning Outcomes:

Welcome to *Introduction to Biochemistry*, where you will begin to learn how life works at the molecular level. Biochemistry is at the nexus of the physical, natural and medical sciences, yet has developed its own language and culture that are distinct from those disciplines. The knowledge and tools of biochemistry and molecular biology will continue to be at the forefront of discoveries in medicine and biotechnology, driving advances in such areas as molecular and personalized medicine, nanotechnology, agriculture, environmental remediation, and evolution. The concepts and skills obtained in this course will prepare you for more advanced training in biochemistry & molecular biology for careers in biotechnology, biomedical research, medicine, and other health professions.

At the end of this course, you will be able to:

1. Use your knowledge of fundamental principles of chemistry and physics (e.g. molecular bonding, thermodynamics, kinetics) to explain important concepts in biochemistry.
2. Describe and interrelate the hierarchical levels of protein structure (1˚ to 4˚) and provide examples of how this structure relates to the function (or dysfunction) of various classes of proteins.
3. Explain how enzymes can increase the rates of biochemical reactions at the molecular level, and how enzymes may be inhibited and regulated.
4. Outline the major pathways by which precursor biomolecules (carbohydrates, lipids, amino acids, nucleotides) are synthesized and degraded, and the key points at which these pathways are regulated.
5. Describe how organisms obtain, store, and utilize energy through metabolic interconversion of biomolecules.
6. Understand how metabolic pathways are controlled to maintain homeostasis of organisms under normal physiological conditions, and how this may be disrupted by certain pathological states.
7. Place biochemical events within a genomic and cellular context.
8. Relate/apply the fundamental biochemical concepts to your life and your daily activities.

Course Expectation:

Access all course materials via Brightspace at https://dal.brightspace.com/

	Course Expectation for Semi-Flipped Classes
Pre-class	• Preview lecture notes • For flipped class, watch the video lecture
In-class	• Actively engage in the lecture (taking notes, Q&A) • Practice on worksheets during the flipped class[#]
Post-class	• Complete *Smartwork* HomeWorks • Work on additional end of chapter questions • Access complementary learning materials from MIT

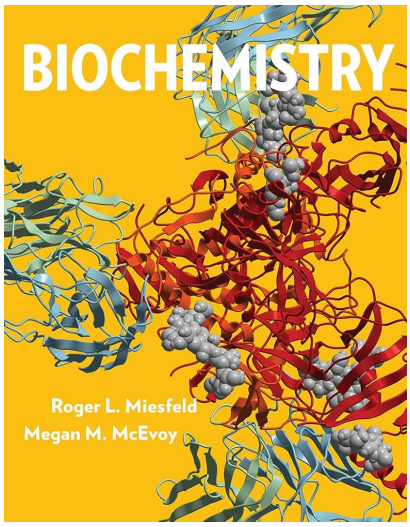
[#] Flipped class will not be recorded. Answers to In-class worksheets are provided during class only.

Student Support:

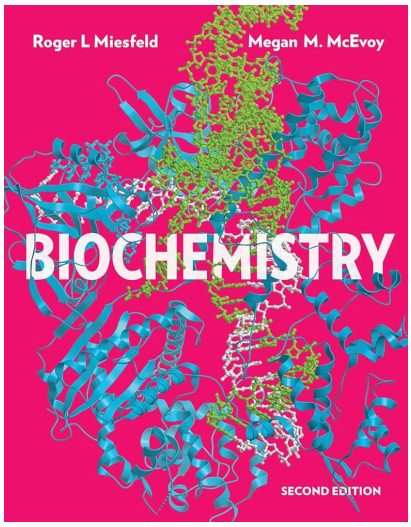
Within our class, there are multiple ways to seek out help. Below, we highlight the purpose of each method:

Method	Purpose	Advantage	Turn-around
Brightspace Discussion Board	Ask any questions on the course content & administration.	Fast response, easily accessible, open for everyone to see and share.	Every 1-2 hours from 9 – 5 PM
Course email: BIOC2300@dal.ca	Ask **short** course content & administration related questions.	Managed by the TAs	8 hours to 1 day
Student Hours: TBD	• Provides an open and accessible place to study and work individually or in a small group. • Nurture a community of learning biochemistry. • Meeting with TAs and Instructors	• In-person help session throughout the week • Work and learn in a supervised environment. • Clarify general misconceptions/confusion. • Discuss learning strategies.	Weekly and immediate feedback
Dr. Xiong's email: shawn.xiong@dal.ca	For any administration related questions and/or private conversations	• Flexible and private. • Short but highly effective and efficient;	8 hours to 1 day
Companion lecture materials from **MIT**	Provide alternative learning materials including lecture videos, problem sets, and exams	• High quality • Free of charge • Comprehensive & Flexible	Available at all time
Generative A.I.	You are welcome to use gen-A.I. to assist and scaffold your learning and problem solving in order to achieve fluency and mastery in core concepts in BIOC 2300. Please view gen-A.I. in our course as the training wheels on a bicycle. Your goal is to bike proficiently without the training wheels at the end, meaning thinking and problem solving independently.		

Course Textbook:



1st edition



2nd edition

Textbook is required. You are welcome to use either edition of the physical textbook, however, only the 2nd edition offers online access to Smartwork. You have 4 options to acquire the online access from the Dal bookstore:

1. **Highly recommended**: All digital - Ebook With Smartwork (CampuseBookstore.com Access Code) $102.96
2. Alternatives:
    a. Hybrid access - Loose Leaf With Smartwork (Loose-leaf) $167.99
    b. Hybrid access - Hardback With Smartwork (Hardback) $257.99
    c. Only Smartwork access $71.96
3. **All access is good for 2 years**.
4. Use the link provided on Brightspace to acquire, register, and access Norton Online materials.

Course Assessment:

Assessment	Date	Weight (%)
Smartwork Homework[a]	Varied	25
Term Test 1[b]	Feb. 10th, 7:00 – 8:30 PM	20
Term Test 2	March 18th, 6:30 – 8:00 PM	20
Final Exam[c]	*Scheduled by registrar*	35

Conversion of numerical grades to Final Letter Grades follows the Dalhousie Common Grade Scale: https://www.dal.ca/campus_life/academic-support/grades-and-student-records/grade-scale-and-definitions.html

Note: Numeric grades will be rounded to the nearest whole number before being converted to a letter grade. No exceptions will be made.

[a.] **Smartwork Homework**:

- Released right after completing each module. Approximately one homework per week.
- Average length of homework is 1hr. The time is estimated based on a student who is on track with course materials and has reviewed the relevant lectures and/or textbook contents.
- For each question, you have 3 attempts with 11% penalty for each incorrect answer that differentiate A+, A, and B+.
- No reopening of missed homework. However, you can still access the content for practice with answers provided.
- Due dates: There are three general due dates for Smartwork homework, which are Feb. 10th, Mar. 18th, and final exam date. This means homework covers materials on Term Test 1 is due on Feb. 10th; homework covers Term Test 2 is due on Mar. 18th; and the left over homework at the end is due on the final exam date, scheduled by the registrar.

[b.] **Term Tests** are non-cumulative:

- You have 90 minutes to write each term test.
- The test will consist of true/false/explain questions, fill-in blanks, concept maps, drawing structures and graphs, and short-answer questions.
- Continued next page...

- You are allowed **to bring in a cue sheet**. Use designated A4 paper to add course content on 1 side of the A4 paper only either by hand or by computer. The designated A4 paper will be provided in-class and online.
    - Violation to this rule will result in a grade of 0.
- In case of a university closure on the term test day, the exam will be launched online through **Brightspace Respondus Monitor** (browser lockdown + webcam monitoring).
    - Please test your computer with the Respondus Check-in quiz on Brightspace.
- Credits of unwritten term test(s) will be transferred to the final exam, regardless of reasons. This means:
    - we no longer require SDA for missed term test(s).
    - we no longer offer make-up tests.

c. **Final exam** is cumulative and will be scheduled by the registrar during the final's week in April.

- You are allowed to bring in a cue sheet. Use designated A4 paper to add course content on both sides of the A4 paper either by hand or by computer. The designated A4 paper will be provided in-class and online.
- Make-up final exam in the past has always been scheduled on the last day of the final exam period or the first day after the final exam period.
- Travelling during the final exam period does not qualify for accommodation.

Please note, even though we are not strictly asking for explanation of absence nor the submission of SDA (for greater accessibility), our course still operates under the guidance of the university policies on short and long leave of absence.

- In accordance with the short leave of absence policy - *Students can submit a maximum of two separate Student Declaration of Absence forms per course during a term and one SDA for the final exam*.
- For major or chronic illness and other long-term or recurring absences, students should seek professional care, refer to the University's Student Accommodation Policy, and register with an advisor at the Advising and Access Services Center.

Course Schedule 2026

Month	Date	Day	Lecture #	Class	Book Chapter	Multi-Faith Calendar
January	7th	Wed.	1	Introduction & Review	Chapter 1	Christmas (Julian Calendar)
	9th	Fri.	2	Laws of Thermodynamics	Chapter 2	
	12th	Mon.	3	Aqueous Chemistry - **Flipped**	Chapter 2	
	14th	Wed.	4	Nucleic Acid 1	Chapter 3	Makar Sankranti
	16th	Fri.	5	Nucleic Acid 2	Chapter 3	
	19th	Mon.	6	Protein Structure & Function 1 - **Flipped**	Chapter 4	Theophany
	21st	Wed.	7	Protein Structure & Function 2	Chapter 4	
	23rd	Fri.	8	Protein Structure & Function 3	Chapter 4	Vasanta Panchami
	26th	Mon.	9	Methods in Protein Biochemistry - **Flipped**	Chapter 5	
	28th	Wed.	10	Hemoglobin & Myoblogin	Chapter 6	
	30th	Fri.	11	Enzyme 1	Chapter 7	
Febrary	2nd	Mon.	12	Enzyme 2	Chapter 7	
	4th	Wed.	13	Membrane Transport - **Flipped**	Chapter 6	
	6th	Fri.	Munro Day			
	9th	Mon.	Term Test 1 Review in class			
	10th	Tues.	Term Test 1 @ 7:00 PM - 8:30 PM			
	11th	Wed.	14	Cell Signaling	Chapter 8	
	13th	Fri.	15	Glycobiology 1	Chapter 9	
	16th	Mon.	Winter Break			
	18th	Wed.				
	20th	Fri.				
	23rd	Mon.	16	Glycobiology 2 - **Flipped**	Chapter 13	
	25th	Wed.	17	Glycolysis 1	Chapter 9	
	27th	Fri.	18	Glycolysis 2	Chapter 9	
March	2nd	Mon.	19	Citrate Cycle - **Flipped**	Chapter 10	
	4th	Wed.	20	Oxidative Phosphorylation 1	Chapter 11	
	6th	Fri.	21	Oxidative Phosphorylation 2	Chapter 11	Ramaḍān
	9th	Mon.	22	Pentose Phosphate Pathway - **Flipped**	Chapter 14	
	11th	Wed.	23	Glyconeogenesis	Chapter 14	
	13th	Fri.	24	Glycogen Metabolism 1	Chapter 14	
	16th	Mon.	25	Glycogen Metabolism 2 - **Flipped**	Chapter 14	
	18th	Wed.	Term Test 2 Review Term Test 2 @ 6:30 PM - 8:00 PM			
	20th	Fri.	26	Lipid Structure & Function	Chapter 15	ʿĪd al-Fiṭr
	23rd	Mon.	27	Lipid Metabolism 1	Chapter 16	
	25th	Wed.	28	Lipid Metabolism 2	Chapter 16	
	27th	Fri.	29	Lipid Metabolism 3	Chapter 16	
	30th	Mon.	30	Amino Acid Metabolism - **Flipped**	Chapter 17	
April	1st	Wed.	31	Nucleotide Metabolism	Chapter 18	Passover
	3rd	Fri.	Good Friday			
	6th	Mon.	32	Flexible/Catch-up		
	8th	Wed.	Final Exam Review			Passover
	9th	Thu.=Fri.				Passover
	11th-27th	Final Exam Period				

Note:

- This proposed schedule may be subject to change due to university closure, and the updated schedule will be announced on Brightspace.
- Only dates with recommended accommodation are listed in the column of multi-Faith Calendar.

University Policies and Statements

This course is governed by the academic rules and regulations set forth in the University Calendar and by Senate

Academic Integrity

At Dalhousie University, we are guided in all of our work by the values of academic integrity: honesty, trust, fairness, responsibility and respect (The Center for Academic Integrity, Duke University, 1999). As a student, you are required to demonstrate these values in all of the work you do. The University provides policies and procedures that every member of the university community is required to follow to ensure academic integrity.

Information: https://www.dal.ca/dept/university_secretariat/academic-integrity.html

Accessibility

The Advising and Access Services Centre is Dalhousie's centre of expertise for student accessibility and accommodation. The advising team works with students who request accommodation as a result of a disability, religious obligation, or any barrier related to any other characteristic protected under Human Rights legislation (Canada and Nova Scotia).

Information: https://www.dal.ca/campus_life/academic-support/accessibility.html

Student Code of Conduct

Everyone at Dalhousie is expected to treat others with dignity and respect. The Code of Student Conduct allows Dalhousie to take disciplinary action if students don't follow this community expectation. When appropriate, violations of the code can be resolved in a reasonable and informal manner—perhaps through a restorative justice process. If an informal resolution can't be reached, or would be inappropriate, procedures exist for formal dispute resolution.

Code: https://www.dal.ca/dept/university_secretariat/policies/student-life/code-of-student-conduct.html

Diversity and Inclusion – Culture of Respect

Every person at Dalhousie has a right to be respected and safe. We believe inclusiveness is fundamental to education. We stand for equality. Dalhousie is strengthened in our diversity. We are a respectful and inclusive community. We are committed to being a place where everyone feels welcome and supported, which is why our Strategic Direction prioritizes fostering a culture of diversity and inclusiveness

Statement: http://www.dal.ca/cultureofrespect.html

Recognition of Mi'kmaq Territory

Dalhousie University would like to acknowledge that the University is on Traditional Mi'kmaq Territory. The Elders in Residence program provides students with access to First Nations elders for guidance, counsel and support. Visit or e-mail the Indigenous Student Centre (1321 Edward St) (elders@dal.ca).

Information: https://www.dal.ca/campus_life/communities/indigenous.html

Important Dates in the Academic Year (including add/drop dates)
https://academiccalendar.dal.ca/Catalog/ViewCatalog.aspx?pageid=viewcatalog&catalogid=117&chapterid=-1&topicgroupid=31821&loaduseredits=False

University Grading Practices

https://www.dal.ca/dept/university_secretariat/policies/academic/grading-practices-policy.html

Student Resources and Support

Advising

General Advising https://www.dal.ca/campus_life/academic-support/advising.html

Science Program Advisors: https://www.dal.ca/faculty/science/current-students/undergrad-students/degree-planning.html

Indigenous Student Centre: https://www.dal.ca/campus_life/communities/indigenous.html

Black Students Advising Centre: https://www.dal.ca/campus_life/communities/black-student-advising.html

International Centre: https://www.dal.ca/campus_life/international-centre/current-students.html

Academic supports

Library: https://libraries.dal.ca/

Writing Centre: https://www.dal.ca/campus_life/academic-support/writing-and-study-skills.html

Studying for Success: https://www.dal.ca/campus_life/academic-support/study-skills-and-tutoring.html

Copyright Office: https://libraries.dal.ca/services/copyright-office.html

Fair Dealing Guidelines https://libraries.dal.ca/services/copyright-office/fair-dealing.html

Other supports and services

Student Health & Wellness Centre: https://www.dal.ca/campus_life/health-and-wellness.html

Student Advocacy: https://dsu.ca/dsas

Ombudsperson: https://www.dal.ca/campus_life/safety-respect/student-rights-and-responsibilities/where-to-get-help/ombudsperson.html