

Faculty of Science Course Syllabus
Department of Biochemistry & Molecular Biology
BIOC 2610.03
Introductory Biochemistry Lab
Winter 2023

Instructors:	H. MacKinnon (Instructor)	heidi.mackinnon@dal.ca		
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Laboratories:	B01	Monday	2:35 – 5:25 p.m.	Tupper 8-J1
	B02	Thursday	2:35 – 5:25 p.m.	Tupper 8-J1
	B03	Friday	2:35 – 5:25 p.m.	Tupper 8-J1

Course Description

An introduction to fundamental techniques in Biochemistry through the exploration of the properties of essential biomolecules. This course is intended for students in Biochemistry & Molecular Biology and Microbiology & Immunology programs.

Course Prerequisites

BIOL 1010.03 and 1011.03 (or equivalent), CHEM 1011.03 and 1012.03 (or equivalent), all with grades of B- or higher, or instructor's consent.

Course Corequisites

BIOC 2300.03 and CHEM 2401.03 and CHEM 2402.03 or instructor's consent.

Course Objectives/Learning Outcomes

General objectives:

- Analyze and manipulate raw experimental data by applying theory, mathematical relationships, and graphical analysis.
- Interpret experimental results and present in scientific format (tables, graphs, diagrams, and written reports). Compare with expected results and draw conclusions.
- Develop a formal scientific writing style and compose multiple formal lab reports. Reports are written in APA style compiled in journal submission format.
- Relate research literature to laboratory experiments. Discover and identify primary sources. Incorporate relevant citations in formal lab reports.
- Apply and extend conceptual knowledge consistent with the practical aspects of biochemistry and molecular biology lab work.

Introduction to biochemical lab techniques:

- Precise volume handling using a Gilson Pipetman and pipet aid
- Titration curves of amino acids
- Spectrophotometry: using Spectronic 20D+, Spectronic 601 and Biowave DNA (UV/Vis)
- Protein properties: solubility, buffering capacity, and Bradford assay
- DNA properties: hyperchromic effect, quantification, and isolation
- Mass analysis of substances separated by column chromatography
- Investigation of the dialysis technique
- Paper electrophoresis of amino acids
- Proton NMR spectroscopy of amino acids
- Reversibility of an enzyme reaction, cofactor specificity, and thermodynamic values
- Separating materials using thin layer chromatography
- Coupled enzyme assays and quantifying enzyme activity
- Enzymes: mechanisms, kinetic assays, kinetic constants, and inhibition

Course Materials

Brightspace

Online course material (<https://dal.brightspace.com>)

Required

American Psychological Association (2020). *Publication manual of the American Psychological Association* (7th ed.). <https://doi.org/10.1037/0000165-000>

Briggs, P. & MacKinnon, H. (2023). *BIOC 2610 Introductory Biochemistry Lab*. Halifax, NS: Dalhousie University.

Other Recommended Textbooks

Northey, M. & von Aderkas, P. (2019). *Making Sense, Life Sciences: A Student's Guide to Research and Writing* (3rd ed.). Oxford University Press Canada.

Pratt, C. W. & Cornley, K. (2021). *Essential Biochemistry*. (5th ed.). Hoboken, NJ: John Wiley & Sons Inc. (RECOMMENDED, other introductory textbooks may also be suitable)

Segel, I. H. (1976). *Biochemical Calculations*. New York, NY: John Wiley & Sons Inc.

Ahern, K. (2018). *Biochemistry Free For All*. Corvallis, OR: Oregon State University. <https://biochem.oregonstate.edu/content/biochemistry-free-and-easy>

Course Assessment

Component	Weight (% of final grade)	Date
Assignments	6% (3% each)	(dates in Brightspace)
Pre-Labs	8% (1% each)	(dates in Brightspace)
Lab Reports	35% (5% each)	(dates in Brightspace)
Extended Learning	16% (2% each)	(dates in Brightspace)
Final Exam (3 hours)	35%	(scheduled exam period)

Conversion of numerical grades to Final Letter Grades follows the Dalhousie Common Grade Scale

A+ (90-100)	B+ (77-79)	C+ (65-69)	D (50-54)
A (85-89)	B (73-76)	C (60-64)	F (<50)
A- (80-84)	B- (70-72)	C- (55-59)	

Laboratory Reports (General Marking Scheme)

One of the objectives of this course is to help you develop as a writer in science. Formal lab report format is based on the APA Publication Manual (2020), with minor accommodations for electronic submissions and handwritten components. Review other areas in text as required.

Presentation – 0.5 pt

Use APA formatting. A title page template is available online. The markers will evaluate such areas as title, formatting, organization, overall neatness, spelling, and grammar.

Abstract – 1 pt

An abstract is a comprehensive summary of the entire paper.

Introduction – 2 pts

Present background information relevant to the lab. You must include in text citations (see *References*). State the main objectives and hypotheses.

Methods – 2 pts

Start the methods section by citing the lab manual. Continue to write out methods for a scientific audience. The reader should be able to replicate, but not exactly duplicate the experiment. For all reports in this course, do not include lists or tables.

Results & Discussion – 4 pts

Include all raw data such as masses, absorbance readings, and other observations. Always show calculations and use the appropriate significant figures. Have a TA verify the integrity of your raw data during the lab, if necessary, we can facilitate the acquisition of raw data more consistent with expectations. If instructed to use data gathered by others, you should do your own analyses. Results are preferably tabulated and graphed and referred to in this section (see *Appendices*). Analyze your results and compare with those expected from published data, class results, or expectations. Discuss the significance of your results, any implications, or other points to consider. Describe any drawn conclusions.

References – 0.5 pt

You must include the full citation of references used in the text of the lab report. Include at least two references with each submission, one of which will always be the lab manual. Only use primary sources. Format in-text citations and corresponding reference list conforming to the APA Publication Manual (2020).

Appendices (part of Results & Discussion section)

Do not label this section as “Appendices”, after the *References* section include the following items in order:

- a) Tables – Using a word processor, tabulate experimental data (i.e., pH, masses, volumes, absorption values, etc.); transcribe raw data as required. Include table number, title, and notes. Present one table per page.
- b) Figures – All graphs (on graph paper), diagrams, and sample calculations must be prepared by hand and included as figures (scan and include as required). Include figure number, title, and notes. Present one figure per page.

Use Microsoft Word and the provided report template to prepare a **formal lab report**; scan and include any handwritten components within the same document (graphs, figures, etc.). **Export/save file in .pdf format. Your file name should conform to the structure netID-R1.pdf.** Upload a single pdf file to the appropriate folder in Brightspace before the posted deadline (refer to Brightspace for current due dates/times).

Report and Assignment Submissions

Lab reports follow strict formatting guidelines (APA), assignments are less stringent in their format (handwritten preferred). Every student will submit an electronic version of their lab reports and assignments to Brightspace for assessment; upload a single pdf file to the appropriate folder in Brightspace before the posted deadline (refer to Brightspace for current due dates/times). All submissions will be screened for plagiarism using the Ouriginal tool (formerly Urkund) integrated within Brightspace. Suspected academic integrity offenses will be investigated and could result in a loss of all value for that component or further penalty in the course. Once graded, there will be no reconsideration of a returned marked report beyond one week.

Students work in groups in the lab. **Independent submissions** are evaluated individually and therefore are to be an individual effort; do your own calculations, prepare your own tables/graphs, and draw your own conclusions. Students are given the option to work together with their lab partner to submit a single lab report (same data set). **Group submissions** are permitted for a maximum of three formal lab reports. Assignments, pre-labs, and extending learning questions do not qualify for group submission, these must be completed and submitted individually.

Zero Tolerance Late Policy

Refer to Brightspace for all current due dates/times. There is a zero-tolerance policy for any late submissions (1 min = late). Late submissions will not be accepted and will result in a mark of zero for that component. Plan for the unexpected; work ahead and backup your files (OneDrive is recommended). Extensions to deadlines will not be granted, no exceptions. A report of a short-term illness will not be accepted when used to justify missing a deadline; please refer to the course policy regarding student absences.

<p>Late work will not be accepted and will result in a mark of zero, no exceptions.</p>
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Written Final Exam

A comprehensive final exam (3 hours) will be written in person as scheduled by the Registrar's Office during the exam period at the end of the term. A student who misses the final exam due to illness must email the course instructor(s) prior to the absence and provide appropriate documentation within 5 calendar days; no SDA required. Special make-up exams (if offered) will normally be written within 7 calendar days after the missed exam; students are expected to be available if needed (schedule travel plans accordingly).

You are responsible for understanding the concepts and details mentioned throughout the lab manual, in Brightspace, and in class. Be critical of experimental details; every step is important and carefully chosen. Rewording of extended learning questions and assignments will test your understanding. In general, you should be able to interpret raw data, diagrams, tables, and graphs that demonstrate and build on what you have seen in the lab. Knowing what content is relevant is part of the assessment, consider this when studying.

Course Policies

Policy Statements

In the event that non-compliance with the program adversely impacts the well-being of a member of the University, the supervisor (lab instructor or professor) will be responsible for intervening to achieve compliance.

Use of Animals in Biochemistry

From the University Undergraduate Calendar, Biochemistry: "Although no exercise involves live animals, experiments may use materials derived from animal sources, as well as from plants and micro-organisms."

Scent-Free Policy

Dalhousie University's scent-free policy will be strictly enforced. As it relates to you, "staff, faculty, students and visitors are requested to refrain from using scented personal care products" such as soap, perfume, hairspray, cologne, aftershave, and deodorants. Non-compliant individuals will be escorted from the lab and a mark of zero will be recorded for that experiment. To the extent practical, Dalhousie University will provide a scent-free indoor environment.



Attendance

Attendance in the lab is mandatory. Students are required to attend the section they are registered for. Experimental work must be completed within the scheduled time, there will be no makeup labs. Please refer to the course policy regarding student absences.

Bring your lab manual and a calculator to each lab. Graph paper and rulers are available in lab. Be prepared and stay on task, review all relevant materials prior to each lab module.

University Closure

The lab schedule may be adjusted due to university closure, any alterations will be posted to Brightspace. In the event of closure on the deadline day electronic submissions are still due by the original deadline, prepare by submitting any work early if necessary. Alternations to course assessments may also be necessary in the event of unforeseen situations.

Other Course Requirements

Review relevant sections in an introductory biochemistry course textbook to extend your knowledge of the work being considered and provide a suitable background for understanding the results you obtain. Many of you may be familiar with other sources of information that you would prefer to use; please do so.

Policy on Missed Academic Requirements due to Student Absence

You must email the course instructor(s) **prior to any absence**. Any accommodations resulting from an absence must be arranged with the course instructor(s) **prior to the deadline**.

Absence for a non-medical reason is not generally acceptable except in extenuating circumstances. Elective arrangements such as travel plans is not an extenuating circumstance and will not be accommodated. Alternate arrangements are at the discretion of the course instructor(s). A missed evaluation component for which no satisfactory arrangement has been made will be given a mark of zero. There are no makeup labs, and no additional assessments will be given for extra credit.

Long-term Absence

For absences greater than three [3] consecutive days, a student must notify the course instructor(s) prior to the absence and provide original written documentation within five calendar days. Acceptable documentation may include a note from a primary care health professional or other appropriate documentation.

Short-term Absence

Students experiencing short-term absences of three [3] consecutive days or less must:

- Notify the course instructor(s) by email prior to the scheduled class time or due date and;
- Submit a completed Student Declaration of Absence form (*see below*).

Student Declaration of Absence (SDA) Forms

Upload your completed SDA form to the designated submission folder in Brightspace for the course within three [3] calendar days following the day of absence. The submission of an SDA form does not provide an automatic exemption from any academic requirements that were missed or late during an absence. **An SDA form cannot be used for extensions to submission deadlines;** in cases of an absence on a deadline day, the electronic copies of your submissions are still due by the original deadline.

<p>SDA forms will not be accepted for weekly laboratory reports or assignments.</p>
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A student may submit a maximum of two separate SDA forms per course during a term. Students who exceed this limit are strongly encouraged to meet with a Faculty member, Declared Major Advisor, or Faculty Program Coordinator. In cases of recurring absences, it is at the instructor(s)' discretion to disallow further SDAs and deny alternate coursework arrangements.

Dalhousie University Policy

https://www.dal.ca/dept/university_secretariat/policies/academic/missed-or-late-academic-requirements-due-to-student-absence.html

Policy on Plagiarism – Department of Biochemistry & Molecular Biology

What is plagiarism?

“Dalhousie University defines plagiarism as the presentation of the work of another as if it were one’s own”
†. Plagiarism is a form of academic fraud. The Department is committed to protecting honest students against the devaluation of their work by students who resort to plagiarism.

Some examples of plagiarism include (but are not restricted to):

- Submitting as your own work any material created, in whole or in part, by someone else, including material created in collaboration with other students, unless specifically allowed by the course instructor and credited appropriately.
- Paraphrasing extensively or copying from sources such as the Internet, journal articles, or books (including textbooks) without crediting the original author or source.
- Using another student’s laboratory data, unless specifically allowed by the course instructor and credited appropriately.
- Submitting, in whole or in part, any work that has been submitted in another course, or re-submitting the same work in different years of the same course.

How can plagiarism be detected?

If required by the Instructor, work submitted for credit must be submitted in electronic as well as hard copy form. Submissions may be screened by one or both of the following methods:

- A pattern recognition program that compares all submissions with one another as well as submissions from previous years. Every individual has a unique pattern of writing. This program will detect submissions that are derived from a common source, even if words or phrases have been changed.
- A third-party computer-based assessment system that compares submissions against a large database including previous submissions and Internet sources.

What are the consequences of plagiarism?

“Plagiarism is a serious academic offence which may lead to loss of credit [‘F’ in a course], suspension or expulsion from the University, or even the revocation of a degree.”† At Dalhousie University, the Department is obligated to refer any cases of suspected plagiarism to the Senate Discipline Committee, which will then conduct a hearing to evaluate the innocence or guilt of students alleged to have committed an act of plagiarism.

How can accusations of plagiarism be avoided?

You can avoid accusations of plagiarism by:

- Preparing all submissions independently and ensuring that they are expressed in your own unique writing style.
- Never sharing any written or electronic material with other students. You may discuss ideas with other students but you may not work with another student while preparing materials you are planning to hand in.
- Acknowledging any material paraphrased extensively or copied from sources such as the Internet, journal articles or textbooks. Paraphrasing of short phrases from the course textbook need not be acknowledged.
- Guarding all your work, both drafts and final submissions, to ensure that no one else can copy it. If you provide access to your work and someone copies it, then you may have to appear before the Senate Discipline Committee to establish that you are the original creator of the work. If you suspect that someone has taken any of your work, notify your course instructor immediately.
- Using only laboratory data that you actually collected in the lab. Altering laboratory data is not permitted. If your data are unusable, you must still report your own data along with any explanation as to why the data are unusable. You may then use data supplied by the lab instructor for analysis, but you must acknowledge such use.

† Dalhousie University Undergraduate Calendar, 2019/2020, p. 42

Adopted May 1st, 2006

Faculty of Science Course Syllabus (Section B)
Fall/Winter 2022-23
BIOC 2610.03

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&loaduserredits=False>

University Grading Practices

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

**Faculty of Science Course Syllabus (Section C)
Fall/Winter 2022-23
BIOC2610.03**

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

Safety

Biosafety: <https://www.dal.ca/dept/safety/programs-services/biosafety.html>

Chemical Safety: <https://www.dal.ca/dept/safety/programs-services/chemical-safety.html>

Radiation Safety: <https://www.dal.ca/dept/safety/programs-services/radiation-safety.html>

Scent-Free Program: <https://www.dal.ca/dept/safety/programs-services/occupational-safety/scent-free.html>

Dalhousie COVID-19 information and updates: <https://www.dal.ca/covid-19-information-and-updates.html>

2023 SCHEDULE

Week of:	Lab Module
January 9	Introduction A1 Liquid Handling, Acids & Bases, NMR Spectroscopy
January 16	R1 Ionizable Groups of Biological Compounds
January 23	R2 Properties of Biomolecules: Proteins
January 30	Advising Week
February 6	R3 Properties of Biomolecules: DNA
February 13	R4 Separation of Materials Based on Molecular Size
February 20	Study Break
February 27	R5 Electrophoresis of Amino Acids
March 6	R6 Experiments with Lactate Dehydrogenase
March 13	Flex Week
March 20	R7 Experiments with Aminotransferase
March 27	A2 Enzyme Kinetics
April 3	Flex Week

*The timetable may be adjusted due to university closure.
Changes will be posted to Brightspace.*