Undergraduate Handbook in **BIOCHEMISTRY & MOLECULAR BIOLOGY**

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Quick Reference Tables

Table 1: Quick Reference Listing of Degree Requirements

Core degree requirements (including minimum grade requirements) for all Biochemistry and Molecular Biology 120 credit hour Major or Honours programs:

Year	Courses	Description
I	**CHEM 1011 & 1012**	Concepts in Chemistry (or equivalent) – **B- or better for BIOC 2610**
	BIOL 1010 & 1011	Principles of Biology (or equivalent) – **B- or better for BIOC 2610**
	MATH	6 credit hours (MATH 1000 or 1215 and MATH 1010 or 1060)
	Writing Class	SCIE 1111 [3 credit hours] or 6 approved credit hours
II	**BIOC 2300**	Introduction to Biochemistry – **B- or better for BIOC 3300 & 3700**
	BIOC 2610	Biochemistry Laboratory Methods & Techniques – **B- or better for BIOC 3700 & BIOC 3300** ***(not required for BIOC 3300 after Winter 2025)***
	BIOL 2020	Cell Biology – **B- or better for BIOC 3400**
	BIOL 2030	Genetics and Molecular Biology – **B- or better for BIOC 3400**
	CHEM 2201	Introductory Analytical Chemistry. *Note: recommended but not required for double major/combined honours. (Required for programs with Chemistry.)*
	CHEM 2401 & 2402	Introductory Organic Chemistry – **B- or better for BIOC 3700**
III	**BIOC 3300**	Intermediary Metabolism
	BIOC 3400	Nucleic Acid Biochemistry & Molecular Biology
	BIOC 3700	Biomolecular Chemistry
		Note: an average grade of B or better for BIOC 3300, 3400 & 3700 is needed for BIOC 4604/4605 (Honours Research Project)
	BIOC 3XXX/4XXX	Number of credit hours based on program - detailed below
IV	**BIOC 3XXX/4XXX**	Number of credit hours based on program - detailed below

Additional BIOC 3XXX/4XXX requirements by degree:

Program	Credit hour requirements
Concentrated Honours in Biochemistry and Molecular Biology	3 credit hours: any BIOC 3XXX or BIOC 4XXX 9 credit hours: BIOC 40XX, 43XX, 44XX, 45XX, 47XX 6 credit hours: any BIOC 4XXX BIOC 4604/4605 (Research Project I & II)
Combined Honours in Biochemistry and Molecular Biology & another subject (B&MB as First subject)	6 credit hours: BIOC 40XX, 43XX, 44XX, 45XX, 47XX BIOC 4604/4605 (Research Project I & II)
Combined Honours in Biochemistry and Molecular Biology & another subject (B&MB as Second subject)	3 credit hours: any BIOC 3XXX or BIOC 4XXX 6 credit hours: BIOC 40XX, 43XX, 44XX, 45XX, 47XX
Major in Biochemistry and Molecular Biology	9 credit hours: any BIOC 3XXX or BIOC 4XXX 6 credit hours: any BIOC 4XXX
Double Major in Biochemistry and Molecular Biology & another subject	3 credit hours: any BIOC 3XXX or BIOC 4XXX 6 credit hours: any BIOC 4XXX

Note: a grade of C or better is required for you to count a course taken in your Honours subject(s) towards the credit-hour requirements for an Honours degree

Courses outside of BIOC that may be used towards BIOC 3XXX or BIOC 4XXX credit hours:	**BIOC courses that may be taken as electives but that may not be used as BIOC 3XXX credit hours towards a Major or Honours in B&MB:**
CHEM 3601; CHEM 4601; MICI 4033; PATH 4035; PHAC 4403	BIOC 3501; BIOC 3610

Table 2: Quick Reference Listing of Core Biochemistry & Molecular Biology Course Pre-Requisites

Shading is in relation to 3000-level core classes, with unshaded courses covering multiple core B&MB subject areas

Course	Required pre-requisite(s) (with minimum grade)
BIOC 2300	BIOL 1010 (C), CHEM 1011 (C), CHEM 1012 (C)
BIOC 2610	BIOL 1010 (B-), BIOL 1011 (B-), CHEM 1011 (B-), CHEM 1012 (B-). Recommended: CHEM 2201 Co-requisites: BIOC 2300, CHEM 2401, CHEM 2402
BIOC 3300	BIOC 2300 (B-), BIOC 2610 (B-), BIOL 2020, BIOL 2030, CHEM 2401, CHEM 2402. *From Winter 2026 onwards, BIOC 2610 will not be required.*
BIOC 3400	BIOC 2300, BIOC 2610, BIOL 2020 (B-), BIOL 2030 (B-), CHEM 2401, CHEM 2402
BIOC 3620	BIOC 2300 (B-), BIOC 2610 (B-), BIOL 2020 (B-), BIOL 2030 (B-), CHEM 2401, CHEM 2402
BIOC 3700	BIOC 2300 (B-), BIOC 2610 (B-), CHEM 2401 (B-), CHEM 2402 (B-); MATH 1000 or MATH 1215; recommended: CHEM 2201
BIOC 4001	BIOC 3300, BIOC 3400, BIOC 3700 (average grade of B or higher)
BIOC 4010	BIOC 3400
BIOC 4302	BIOC 3300
BIOC 4305	BIOC 3300
BIOC 4403	BIOC 3400 or BIOL 3046
BIOC 4404	BIOC 3400
BIOC 4501	BIOC 3400
BIOC 4604	BIOC 3300, BIOC 3400, BIOC 3700 (average grade of B or higher)
BIOC 4605	BIOC 4604
BIOC 4701	BIOC 3700 or (CHEM 3601 and CHEM 2301 and CHEM 2304)
BIOC 4702	BIOC 3700 or (CHEM 3601 and CHEM 2301 and CHEM 2304)
BIOC 4703	BIOC 3700 or CHEM 3601
BIOC 4813	BIOC 3300

Note for Honours programs:

According to Dalhousie College of Arts & Science regulations, **only courses with a grade of C or better** may be used to **meet Honours degree** requirements

Table 3: Quick Reference Listing of Core Course Pre-Requisite Relationships to Upper-Level BIOC Courses

Course (Term(s)[a])	Pre-requisite for (with minimum grade of)
BIOL 1010 (F) or BIOL 1020 (S)	BIOC 2300 (C), BIOC 2610 (B-)
BIOL 1011 (W) or BIOL 1021 (S)	BIOC 2610 (B-)
CHEM 1011 (F/S)	BIOC 2300 (C), BIOC 2610 (B-)
CHEM 1012 (W/S)	BIOC 2300 (C), BIOC 2610 (B-)
MATH 1010 (F/W/S) or MATH 1215 (F/W/S)	BIOC 3700
BIOC 2300 (F/W)	BIOC 3300 (B-), BIOC 3400, BIOC 3620 (B-), BIOC 3700 (B-). *Co-requisite for BIOC 2610*
BIOC 2610 (W)	BIOC 3400, BIOC 3620 (B-), BIOC 3700 (B-), BIOC 3300 (B-) – *will not be required starting Winter 2026.*
BIOL 2020 (F/W/S)	BIOC 3300, BIOC 3400 (B-), BIOC 3620 (B-)
BIOL 2030 (F/W/S)	BIOC 3300, BIOC 3400 (B-), BIOC 3620 (B-)
CHEM 2201 (F)	Recommended (*not required*) for: BIOC 2610, BIOL 3700
CHEM 2401 (F)	BIOC 3300, BIOC 3400, BIOC 3620, BIOC 3700 (B-) *Co-requisite for BIOC 2610*
CHEM 2402 (W)	BIOC 3300, BIOC 3400, BIOC 3620, BIOC 3700 (B-) *Co-requisite for BIOC 2610*
BIOC 3300 (W)	BIOC 4001[b], BIOC 4302, BIOC 4305, BIOC 4604[b], BIOC 4813
BIOC 3400 (F)	BIOC 4001[b], BIOC 4010, BIOC 4403, BIOC 4404, BIOC 4501, BIOC 4604[b]
BIOC 3700 (F)	BIOC 4001[b], BIOC 4604[b], BIOC 4701, BIOC 4702, BIOC 4703
BIOC 4604 (F/W)	BIOC 4605

[a] Term: F = Fall; W = Winter; S = Summer

[b] Both BIOC 4001 and BIOC 4604 require an average grade of B or better over our three core 3000-level classes (BIOC 3300, BIOC 3400, and BIOC 3700)

Note for Honours programs:

According to Dalhousie College of Arts & Science regulations, **only courses with a grade of C or better** may be used to **meet Honours degree** requirements

Introduction

Biochemistry and Molecular Biology is the study of the molecular basis of life. This science investigates primarily the relationships of structure and function of biological compounds, and the adaptation of structure and function to environmental change. To achieve these goals, biochemistry uses a specific approach that combines basic principles of chemistry, biology, physics, and mathematics to dissect complex biological processes. Molecular biology is concerned more with the regulation and expression of genetic information. Knowledge acquired from investigating simple life forms has helped us to understand similar processes in complex organisms, and has resulted in the emergence of common themes in metabolism and in the structure and function of macromolecules. This knowledge allows biochemists and biomedical scientists to develop or improve pharmaceutical, industrial, biotechnological and food products and to monitor deleterious biological processes. It assists biomedical scientists and physicians to define the normal state, to describe the biochemical and molecular basis of disease and to improve diagnosis and therapy.

Biochemistry and Molecular Biology Degree Programs

1. Major vs. Honours Degrees

A variety of 4-year (120 credit hour) degree program options are available. A Major provides more flexibility while an Honours has a greater number of specific BIOC credit hour requirements and includes an Honours Research Project (BIOC 4604/4605). Note that an Honours degree is typically required for admission to Graduate School.

1) A **Major** or **Concentrated Honours** may be conducted with Biochemistry and Molecular Biology as your sole degree subject.
2) A **Double Major** or **Combined Honours** in Biochemistry and Molecular Biology may also be completed with wide variety of other subjects. For a Double Major, there's no distinction between the two subjects of your Major (i.e., see Table 1 above for requirements). In a Combined Honours degree, the "1st subject" is the subject that you complete your Honours Research Project in and the "2nd subject" is then the other subject of the degree and typically has less credit hour requirements.
3) Occasionally a student wants to follow a course of study that does not fit within a concentrated or combined honours framework. The **multidisciplinary honours program** allows for this, with a requirement for **72.0** credit hours above the 1000-level in **three** or more subject areas. Graduates from a multidisciplinary honours program almost always need to do extra course work to pursue graduate studies in any one of their honours subjects. On the other hand, a suitable multidisciplinary honours degree may be excellent preparation for graduate school in Departments without undergraduate degree programs.
4) Finally, with prudent advance planning, any of these degrees may also be combined with a **Minor** in a subject of interest to you and/or with one or more of the variety of **Certificates** that are offered by Dalhousie.

2. Co-op

Any Biochemistry and Molecular Biology Major or Honours degree may be combined with co-op. In the co-op degree, students complete three paid 4-month work-terms (currently, these are scheduled in the Summer term following year 2, the Summer term following year 3, and the Fall term of year 4).

Students typically work with 2-3 different employers, often in different sectors (industry, government, and/or academic labs), for these work terms. The co-op program extends degree completion time by 8 months (i.e. December of year 4 instead of April of year 4) but you have the advantage of having completed 12-months of full-time work in the field. Further information about the co-op program is available from the Department's Co-op Advisor.

3. Minor in Biochemistry and Molecular Biology

To complete a Minor in Biochemistry and Molecular Biology, you must complete 18.0 credit hours in BIOC credits at the 2000-level and above. This would allow you to complete a 90-credit hour BSc degree with a Minor in Biochemistry and Molecular Biology. It can also be combined with another Major or Honours subject, giving you a Minor in Biochemistry and Molecular Biology. ***Note that courses required for your Major or Honours subject cannot be "double-counted" towards a Minor.***

Frequently Asked Questions

1. What Are the Minimum Standards for My Degree?

All degrees: At least 72 of the 120 total credit hours must be beyond the 1000 level.

Major: You must achieve a cumulative GPA of at least 2.0 to graduate; however, many courses required in our program have specific pre-requisite grade requirements. Pre-requisite requirements for core BIOC courses are summarized in Tables 1 and 2 below.

Honours: Several requirements must be met over and above those noted above.

1) All courses required for the program must be completed with a grade of C or better in order for those credit hours to count towards the program requirements.
2) A minimum cumulative GPA of 3.0 must be achieved for all courses required for the degree. First-class Honours is awarded if the cumulative GPA for your honours subject courses is 3.7 or higher, while a degree is awarded With Distinction if the cumulative GPA for <u>all</u> courses is 3.7 or higher.
3) An average grade of B or better is required for the three core 3000-level classes BIOC 3300, BIOC 3400, and BIOC 3700. Without meeting this average grade, you will not be able to register for the Honours Research Project (BIOC 4604/4605).

2. What Electives Should I Take?

There is no "one size fits all" answer to this question! Electives should be chosen based on your interests and longer-term plans. You may wish to use some of your elective credit hours to take additional biochemistry and molecular biology courses, for example. Like any field of study, biochemistry also has links to many other subjects. Some of these are biology, chemistry, mathematics, microbiology, physics, and psychology. Taking electives in these complementary subjects may be beneficial for you to develop expertise in area(s) that will support your future career goals. You may also wish to use your elective credit hours to explore completely disparate subjects, and any of our degrees provide you the flexibility to do this.

3. What Is Experiential Learning and When Should I Find a Supervisor?

BIOC 3620 (Experiential Learning) provides an opportunity to gain hands-on experience in one of the research labs in the Department. Students typically take this course in the Winter term of year 3, although other timing may be possible. Many students (and supervisors!) will use this as an opportunity to test whether or not that research lab is a good fit for them before embarking on an honours research project. It should be noted that BIOC 3620 is not a pre-requisite for honours research, however, and that this course is also open to students in Major programs. The best opportunity to find a supervisor is during our Departmental Research Opportunity mixer in the Fall term – you'll hear details about this mixer in your BIOC labs and classes in third year.

4. What Is Required for the Honours Application Process and When?

1) All students must fill out an **Honours Application Form** in the **winter term (~March-April) of their third year or in early summer (May-June) between third and fourth year** (with timing offset as appropriate for co-op students). Ensue that you are using the most up-to-date version of the form (linked on our Department website).

2) A faculty member willing to serve as **honours project supervisor must be identified** by the student. This must typically be a faculty member within the Department of Biochemistry & Molecular Biology. Although not required by the Registrar, your Honours supervisor's name should be written on the Honours Application form for Departmental reference purposes.

3) Once the Honours Application Form has been filled out including all planned courses for the final year of study and once an honours project supervisor has been confirmed, **the student must have their Academic Advisor assess and sign the form**. The current allocation of Academic Advisors by student surname is detailed on the B&MB website. Your Application should be sent by email to your Advisor to allow them to assess and evaluate the form. To ensure that you will meet the program requirements, you may wish to meet with your Advisor before and/or after finalizing your course selection and the corresponding Honours Application.

4) Following signature by the Academic Advisor, **the form must be submitted** both to the Department (barb.bigelow@dal.ca) and to the Registrar's Office (registrar@dal.ca).

5) **BIOC 4604/4605 registration** will typically be processed in late-June/early-July following a final verification of meeting the academic requirements and is automatically done for all students who have correctly completed and submitted their Honours Application form.

Note: Students who wish to carry out a Combined Honours must have the Honours Application form signed by Advisors from both of their honours subjects. The 1st Advisor is the Advisor for the program in which the honours project is being carried out and that advisor must sign the form before assessment/signature by the 2nd Advisor. No additional signature is required on the Honours Application form for inclusion of a Minor subject.

5. What Is the Honours Qualifying Examination?

For Biochemistry and Molecular Biology, the Honours Qualifying Examination is assessed on a Pass/Fail basis by the coordinator of BIOC 4604/4605. This relies upon completion of BIOC 4604/4605, including (i) the Honours Research Presentation to the Department and (ii) attendance at and summary of the required number of Department seminars (as detailed in the Honours Research Manual).

6. What Courses Should I Take in Each Subject for My Double Major/Combined Honours Program?

This can be a bit of a moving target as program requirements may change from time to time. The current and accurate Biochemistry and Molecular Biology degree requirements are detailed in this document, but you will need to check with the requirements of the other subject (and an Advisor from that subject) in order to ensure that you meet all requirements.

7. What Calendar Year Do My Program Requirements Fall Under?

When you carry out a Degree Audit through DalOnline, you must be sure that you are using the correct calendar year as this will determine the specifics of your degree requirements. For Degree Audit purposes, the Registrar will apply the calendar year you entered the Faculty of Science. This is independent of the program you have declared *within* Science, so a program change within Science does not change the calendar year applied. This is summarized as follows:

a) If you started your studies at Dalhousie in the Faculty of Science, your program requirements will follow the academic calendar for the year you entered Dalhousie (whether as a first year student or a transfer student from another university).
b) If you started your studies at Dalhousie in a different Faculty or School and subsequently transferred into the Faculty of Science, the year that you transferred into Science is the calendar year that applies for your program requirements.

8. What Happens if a Course I Take Is Required for More Than One Subject of My Double Major or Combined Honours Program?

The credit hours for any course can only be used towards one subject. If you take a course that may be used for either subject (e.g., CHEM 3601 for either CHEM or BIOC; MICI 4033 for either MICI or BIOC; etc.), you can only use that course and those credit hours to count towards one of your two subjects. If a course is required for both subjects, the credit hours again can only count for one subject. For example, CHEM 2401 and CHEM 2402 are required for BIOC, CHEM, and MICI degrees. If you use the CHEM 2401 and CHEM 2402 credit hours towards your BIOC degree requirements, you will still be able to meet the degree requirement of having completed these courses for CHEM or MICI but the courses would contribute 0 credit hours towards the CHEM or MICI credit hour requirements. You would thus need to ensure that you have enough other 2000-level and above credit hours in CHEM or MICI to compensate for these 6 credit hours.

It should be noted that the Degree Audit system can be a bit misleading here, so if in doubt you should discuss this with your Advisors for both subjects. To change the subject that credit hours are being counted towards, a request to the Degree Audit team in the Registrar's Office can be made either by you or by an Advisor. **It is usually most straightforward to request and make this type of change as a "batch request" to Degree Audit in your final year of study**, rather than trying to make many individual changes over the course of your degree since there may be changes needed as you finalize course selection.

9. Am I Allowed to Take Graduate-level Courses?

Dalhousie University Academic Regulations specifically allow Honours students to take up to six credit hours of 5000-level courses as credit towards their undergraduate degree requirements. This requires both the permission of your honours supervisor (i.e., your research supervisor, not the Honours course coordinator) and of the instructor of the graduate course your wish to take. Dalhousie's graduate course grade scale will be applied to you for this course, meaning that you must obtain a grade of B- or better in order to pass the course (i.e., any grade below a B- will result in an F). In some instances, graduate courses taken during an Undergraduate degree can be used as Advanced Placement to satisfy program requirements of a graduate program. It should be noted that the Faculty of Graduate Studies has specific limits on the number of Advanced Placement credit hours that can be used and that this requires formal consideration and approval of both the program's Graduate Coordinator and the Faculty of Graduate Studies.

Academic Advisors

This booklet has been prepared to help you make up your mind about doing a degree in Biochemistry at Dalhousie. Talking can often be a useful addition to reading, so feel free to come and see one of the Faculty Advisors listed below or ask for advice and help through the following link:

https://medicine.dal.ca/departments/department-sites/biochemistry-molecular-biology/about/contact-form.html

More program information may be found here:

https://medicine.dal.ca/departments/department-sites/biochemistry-molecular-biology/programs/undergraduate.html

Undergraduate program advisors
(with advising allocated by student surname):

Dr. J. Rainey (jan.rainey@dal.ca) – advisor for students with surnames starting with F-L and Undergraduate Program Coordinator

Dr. V. Ewart (vewart@dal.ca) – advisor for students with surnames starting with A-E and M

Dr. D. Langelaan (dlangela@dal.ca) – advisor for students with surnames starting with P-U

Dr. C. Slamovits (*on sabbatical Fall 2024*)

Dr. S. Xiong (shawn.xiong@dal.ca) – advisor for students with surnames starting with N-O and V-Z

Co-op program advisor:

Dr. H-S. Ro (hyo-sung.ro@dal.ca)

Undergraduate program administrator:

Ms. B. Bigelow (bbigelow@dal.ca)